

About This Manual . . .

The FT-950 is a leading-edge transceiver with a number of new and exciting features, some of which may be unfamiliar to you. In order to gain the most enjoyment and operating efficiency from your FT-950, we recommend that you read this manual in its entirety, and keep it handy for reference as you explore the many capabilities of your new transceiver.

Before using your FT-950, be sure to read and follow the instructions in the “Before You Begin” section of this manual.

General Description

Congratulations on the purchase of your Yaesu amateur transceiver! Whether this is your first rig, or if Yaesu equipment is already the backbone of your station, rest assured that your transceiver will provide many hours of operating pleasure for years to come.

The FT-950 is an elite-class HF transceiver providing exceptional performance both on transmit and receive. The FT-950 is designed for the most competitive operating situations, whether you primarily operate in contest, DX, or digital-mode environments.

Built on the foundation of the popular FTdx9000 transceiver, and carrying the proud tradition of the FT-1000 series, the FT-950 provides up to 100 Watts of power output on SSB, CW, and FM (25 Watts AM carrier). Digital Signal Processing (DSP) is utilized throughout the design, providing leading-edge performance on both transmit and receive.

Available as an option for the FT-950 is the Data Management Unit (DMU-2000), which provides extensive display capabilities via a user-supplied computer monitor. Included are Band Scope, Audio Scope, X-Y Oscilloscope, World Clock, Rotator Control, and extensive transceiver status displays, in addition to station logging capability.

For exceptional protection from strong nearby incoming signals, the optional RF μ Tuning Kits may be connected via the rear panel, providing extraordinarily sharp selectivity to protect your receiver from close-in interference on a crowded band.

You may select, in the front end, one of two RF preamplifiers, or IPO (Intercept Point Optimization) utilizing direct feed to the first mixer, and/or three levels of RF attenuation in 6-dB steps.

The FT-950 receiver utilizes DSP filtering, incorporating many of the features of the FTDX9000, such as Variable Bandwidth, IF Shift, and Passband Contour tuning. Digital Noise Reduction and Digital Auto-Notch Filtering are also provided, along with a manually-tuned IF Notch filter.

On the transmit side, the Yaesu-exclusive Three-Band Parametric Microphone Equalizer allows precise and flexible adjustment of the wave-form created by your voice and microphone. The Amplitude, Center Frequency, and Bandwidth of equalization may be adjusted independently for the low-frequency, mid-range, and high-audio-frequency spectra, and the transmitted bandwidth may also be adjusted, as well.

Advanced features include Direct Keyboard Frequency Entry and Band Change, Speech Processor, IF Monitor for Voice modes, CW Pitch control, CW Spot switch, Full CW QSK, adjustable IF Noise Blanker, and all-mode Squelch. Two TX/RX antenna ports are provided on the rear panel. Two key jacks are provided (one each on the front and rear panels), and they may be configured independently for paddle input or connection to a straight key or computer-driven keying interface. The CW Message Memory is provided.

Frequency setup is extraordinarily simple on the FT-950. Besides direct frequency entry for both the VFO-A and VFO-B, separate keys are provided for band selection, and each band key accesses three independent VFO frequency/mode/filter settings per band, so you can establish separate VFO settings for three different parts of each band. In addition, 99 memories are provided, each of which stores its own mode and IF filter selection, in addition to frequency, Clarifier offset, and scan-skip status. What's more, five quick-recall ("QMB") memories can instantly store operational settings at the push of a button.

The built-in automatic antenna tuner includes 100 memories of its own, automatically storing antenna matching settings for quick automatic recall later.

Interfacing for digital modes is extremely simple with the FT-950, thanks to dedicated RTTY/PKT connection jack on the rear panel. Optimization of the filter passbands, DSP settings, carrier insertion point, and display offset are all possible via the Menu programming system.

The Yaesu CAT system provides a direct link to the transceiver CPU for computer control and customization of tuning, scanning, and other operating functions. The FT-950 includes a built-in data level converter for direction connection to a personal computer serial port. Yaesu products are supported by most all of the leading contest and DX logging programs, and the extensive programming protocol is included in this manual, if you wish to write your own software!

Advanced technology is only part of the FT-950 story. Vertex Standard stands behind our products with a worldwide network of dealers and service centers. We greatly appreciate your investment in the FT-950, and we look forward to helping you get the most out of your new transceiver. Please feel free to contact your nearest dealer, or one of Vertex Standard's national headquarters offices, for technical advice, interfacing assistance, or accessory recommendation. And watch Vertex Standard U.S.A.'s Home Page for late-breaking information about Vertex, Standard Horizon, and Yaesu products: <http://www.vertexstandard.com>.

Please read this manual thoroughly, so as to gain maximum understanding of the full capability of the FT-950, and we thank you again for your purchase!

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Accessories & Options

Supplied Accessories

Hand Microphone	1 pc	MH-31B8
DC Power Cord	1 pc	T9025225
Separe Fuse (25A)	1 pc	Q0000074
4-pin DIN Plug	1 pc	P0091004
5-pin DIN Plug	1 pc	P0091006
1/4-inch 3-contact Plug	1 pcs	P0090008
3.5 mm 3-contact Plug	1 pcs	P0091046
3.5 mm 2-contact Plug	1 pcs	P0090034
RCA Plug	2 pcs	P0091365
Operating Manual	1 pc	
Warranty Card	1 pc	

Available Options

MD-200A8X	Ultra-High-Fidelity Desk-Top Microphone
MD-100A8X	Desk-Top Microphone
YH-77STA	Lightweight Stereo Headphone
SP-2000	External Speaker with Audio Filter
VL-1000/VP-1000	Linear Amplifier/AC Power Supply
DMU-2000	Data Management Unit
RF μ Tuning Kit A	For 160 m Band
RF μ Tuning Kit B	For 80/40 m Bands
RF μ Tuning Kit C	For 30/20 m Bands
FH-2	Remote Control Keypad
DVS-6	Digital Voice Memory Unit

Before You Begin

Power Connection

The DC power connector for the FT-950 must only be connected to a DC source providing 13.8 Volts DC ($\pm 10\%$), and capable of at least 22 Amperes of current. Always observe proper polarity when making DC connection:

The RED DC power lead connects to the Positive (+) DC terminal: and

The BLACK DC power lead connects to the Negative (-) DC terminal.

We recommend the use of the FP-1030A AC Power Supply. Other models of power supplies may be used with the FT-950, but the 13.8 VDC input voltage, 22-Ampere current capability, and DC cable polarity guidelines described above must be strictly followed.

Note that other manufacturers may use the same type of DC power connections as does your FT-950 transceiver, but the wiring configuration of the other manufacturer's plug may be different from the specified for your transceiver. Serious damage can be caused if improper DC connections are made; consult with a qualified service technician when in doubt.

Caution: Permanent damage can result improper supply voltage, or reverse-polarity voltage, is applied to the FT-950. The Limited Warranty on this transceiver does not cover damage caused by application of AC voltage, reverse polarity DC, or DC voltage outside the specified range of 13.8 V $\pm 10\%$.

When replacing fuses, be certain to use a fuse of the proper rating. The FT-950 requires a 25 A blade fuse.

Extending the Front Feet

In order to elevate the front panel for easy viewing, the front left and right feet of the bottom case may be extended.

- Pull the front legs outward from the bottom panel.
- Rotate the legs counter-clockwise to lock them in the extended position. Be sure the legs have locked securely in place, because the transceiver is quite heavy and an unlocked leg could result in damage, should the transceiver move suddenly.

Retracting the Front Feet

- Rotate the legs clockwise, and push them inward while rotating to the right.
- The front feet should now be locked in the retracted position.

Adjusting the Main Tuning Dial Torque

The torque (drag) of the Main Tuning Dial knob may be adjusted according to your preferences. Simply hold down the rear skirt of the knob, and while holding it in place rotate the knob itself to the right to reduce the drag or to the left to increase the drag. Available adjustment range is 120°.

Resetting the Microprocessor

Resetting Memories (Only)

Use this procedure to reset (clear out) the Memory channels previously stored, without affecting any configuration changes you may have made to the Menu settings.

1. Press the front panel's [POWER] switch to turn the transceiver off.
2. Press and hold in the [A>M] button; while holding it in, press and hold in the front panel's [POWER] switch to turn the transceiver on. Once the transceiver comes on, you may release the [A>M] button.

Menu Resetting

Use this procedure to restore the Menu settings to their factory defaults, without affecting the memories you have programmed.

1. Press the front panel's [POWER] switch to turn the transceiver off.
2. Press and hold in the [MENU] button; while holding it in, press and hold in the front panel's [POWER] switch to turn the transceiver on. Once the transceiver comes on, you may release the [MENU] button.

Full Reset

Use this procedure to restore all Menu, Memory settings, and Tuner Memory settings to their original factory defaults. All Memories will be cleared out by this procedure.

1. Press the front panel's [POWER] switch to turn the transceiver off.
2. Press and hold in the [FAST] and [LOCK] buttons; while holding them in, press and hold in the front panel's [POWER] switch to turn the transceiver on. Once the transceiver comes on, you may release the other two switches.

Important Note: When the optional μ Tuning Kit is connected to the FT-950, disconnect the all cables from the μ Tuning Kit then perform the Full Reset.

Installation and Interconnections

Antenna Considerations

The FT-950 is designed for use with any antenna system providing a 50 Ohm resistive

impedance at the desired operating frequency. While minor excursions from the 50-Ohm specification are of no consequence, the transceiver's Automatic Antenna Tuner may not be able to reduce the impedance mismatch to an acceptable value if the Standing Wave Ratio (SWR) present at the Antenna jack is greater than 3:1.

Every effort should, therefore, be made to ensure that the impedance of the antenna system utilized with the FT-950 be as close as possible to the specified 50-Ohm value. Note that the "G5RV" type antenna does not provide a 50-Ohm impedance on all HF Amateur bands, and an external wide-range antenna coupler must be used with this antenna type.

Any antenna to be used with the FT-950 must, ultimately, be fed with 50 Ohm coaxial cable. Therefore, when using a "balanced" antenna such as a dipole, remember that a balun or other matching/balancing device must be used so as to ensure proper antenna performance.

About Coaxial Cable

Use high-quality 50-Ohm coaxial cable for the lead-in to your FT-950 transceiver. All efforts at providing an efficient antenna system will be wasted if poor quality, lossy coaxial cable is used. This transceiver utilizes standard "M" ("PL-259") type connectors.

Grounding

The FT-950 transceiver, like any other HF communications apparatus, requires an effective ground system for maximum electrical safety and best communications effectiveness. A good ground system can contribute to station efficiency in a number of ways:

- ❑ It can minimize the possibility of electrical shock to the operator.
- ❑ It can minimize RF currents flowing on the shield of the coaxial cable and the chassis of the transceiver; such currents may lead to radiation which can cause interference to home entertainment devices or laboratory test equipment.
- ❑ It can minimize the possibility of erratic transceiver/accessory operation caused by RF feedback and/or improper current flow through logic devices.

An effective earth ground system may take several forms; for a more complete discussion, see an appropriate RF engineering text. The information below is intended only as a guideline.

Typically, the ground connection consists of one or more copper-clad steel rods, driven

into the ground. If multiple ground rods are used, they should be positioned in a “V” configuration, and bonded together at the apex of the “V” which is nearest the station location. Use a heavy, braided cable (such as the discarded shield from type RG-213 coaxial cable) and strong cable clamps to secure the braided cable(s) to the ground rods. Be sure to weatherproof the connections to ensure many years of reliable service. Use the same type of heavy, braided cable for the connections to the station ground bus (described below).

Inside the station, a common ground bus consisting of a copper pipe of at least 25 mm (1”) diameter should be used. An alternative station ground bus may consist of a wide copper plate (single-sided circuit board material is ideal) secured to the bottom of the operating desk. Grounding connections from individual devices such as transceivers, power supplies, and data communications devices (TNCs, etc.) should be made directly to the ground bus using a heavy, braided cable.

Do not make ground connections from one electrical device to another, and thence to the ground bus. This so-called “Daisy-Chain” grounding technique may nullify any attempt at effective radio frequency grounding. See the drawing below for examples of proper grounding techniques.

Inspect the ground system--inside the station as well as outside--on a regular basis so as to ensure maximum performance and safety.

Besides following the above guidelines carefully, note that household or industrial gas lines must never be used in an attempt to establish an electrical ground. Cold water pipes may, in some instances, help in the grounding effort, but gas lines represent a significant explosion hazard, and must never be used.

Connection of Antenna and Power Cables

Please follow the outline in the illustration regarding the proper connection of antenna coaxial cables, as well as the DC power cable.

Use a short, thick, braided cable to connect your station equipment to the buried ground rod (or alternative earth ground system).

Advice:

- Do not position this apparatus in a location with direct exposure to sunshine.
- Do not position this apparatus in a location exposed to dust and/or high humidity.
- Ensure adequate ventilation around this apparatus, so as to prevent heat build-up and possible reduction of performance due to high heat.

- ❑ Do not install this apparatus in a mechanically-unstable location, or where objects may fall onto this product from above.
- ❑ To minimize the possibility of interference to home entertainment devices, take all precautionary steps including separation of TV/FM antennas from Amateur transmitting antennas to the greatest extent possible, and keep transmitting coaxial cables separated from cables connected to home entertainment devices.
- ❑ Ensure that the DC power cable is not subject to undue stress or bending, which could damage the cable or cause it to be accidentally unplugged from the rear panel DC input jack.
- ❑ Be absolutely certain to install your transmitting antenna(s) such that they cannot possibly come in contact with TV/FM radio or other antennas, or with outside power or telephone lines.

Connection of Microphone and Headphone

Key, Keyer, and Computer-Driven Keying Interconnections

The FT-950 includes a host of features for the CW operator, the functions of which will be detailed in the “Operation” section later. Besides the built-in Electronic Keyer, two key jacks are provided, one each on the front and rear panels, for convenient connection to keying devices.

The Menu system allows you to configure the front and rear panel KEY jacks according to the device you wish to connect. For example, you may connect your keyer paddle to the front panel KEY jack, and use Menu item “037 A1A F-TYPE” for paddle input, while connecting the rear panel’s KEY jack to the keying line from your personal computer (which emulates a “straight key” for connection purposes), and configure the rear panel jack using Menu item “039 A1A R-TYPE.”

Both KEY jacks on the FT-950 utilize “Positive” keying voltage. Key-up voltage is approximately +5V DC, and key-down current is approximately 1 mA. When connecting a key or other device to the KEY jacks, use *only* a 3-pin (“stereo”) 1/4” phone plug; a 2-pin plug will place a short between the ring and (grounded) shaft of the plug, resulting in a constant “key-down” condition in some circumstances.

VL-1000 Linear Amplifier Interconnections

Be sure that both the FT-950 and VL-100 are turned off, then follow the installation recommendations contained in the illustration.

Note:

- ❑ Please refer to the VL-1000 Operating Manual for details regarding amplifier operation.
- ❑ Please do not attempt to connect or disconnect coaxial cables when your hands are wet.

About the CONTROL Cable

The VL-1000 may be operated with the FT-950 whether or not the CONTROL Cable is connected; however, the CONTROL Cable allows you to tune up the amplifier automatically by just pressing the [F SET] or [TUNE] key on the VL-1000, so as to transmit a carrier for tuning purposes.

Set the front panel's INPUT switch to the "INPUT2".

To link the FT-950 and VL-1000 Power switches, set the VL-1000 REMOTE switch to the ON position.

Interfacing to Other Linear Amplifiers

The TX GND OUT pin (pin 2) of the LINEAR jack is a transistor "open collector" circuit, capable of handling positive amplifier relay coil voltages of up to +60VDC at 200 mA or +30 VDC at 1 A. If you plan on using multiple linear amplifiers for different bands, you must provide external band-switching of the "Linear Tx" relay control line from the "TX GND OUT" line at the LINEAR jack.

Important Note!: Do not exceed the maximum voltage or current ratings for the "TX GND OUT" pin (pin 2) of the LINEAR jack. This line is not compatible with negative DC voltages, nor AC voltages of any magnitude.

Most amplifier control relay systems require only low DC voltage/current switching capability (typically, +12V DC at 25 ~ 75 mA), and the switching transistor in the FT-950 will easily accommodate such amplifiers.

Plug/Connector Pinout Diagrams

IMPORTANT NOTE:

The μ -TUNE and DMU connectors are special connectors for this transceiver. Please do not connect any accessory or other device not specifically approved by Vertex Standard. Failure to observe this precaution may cause damage not covered by the Limited Warranty on this apparatus.

Front Panel Controls & Switches

1. [POWER] Switch

Press and hold in this switch for two seconds to turn the transceiver on. Press and hold in this switch for two seconds, similarly, to turn the transceiver off.

2. [ANT 1-2] Switch

Pressing this selects either the ANT 1 or 2 jack on the rear panel, and allows convenient antenna switching at the press of button. The selected antenna jack is indicated at the Block Diagram Display in the display.

3. [TUNE] Switch

This is the on/off switch for the FT-950's Automatic Antenna Tuner.

Pressing this button momentarily places the antenna tuner in line between the transmitter final amplifier and the antenna jack ("TUNER" icon will appear in the display). Reception is not affected.

Pressing and holding in this button for two seconds, while receiving in an amateur band, activates the transmitter for a few seconds while the automatic antenna tuner rematches the antenna system impedance for minimum SWR. The resulting setting is automatically stored in one of the antenna tuner's 100 memories, for instant automatic recall later when the receiver is tuned near the same frequency.

Pressing this button momentarily, while the Tuner is engaged, will take the Automatic Antenna tuner out of the transmit line.

Note: When the Automatic Antenna Tuner is tuning itself, a signal is being transmitted. Therefore, be absolutely certain that an antenna or dummy load is connected to the selected antenna jack before pressing and holding in the [TUNE] button to start antenna tuning.

4. [MOX] Switch

Pressing this button engages the PTT (Push to Talk) circuit, to activate the transmitter (the LED inside this button will glow red). It must be turned off (the red LED will be off) for reception. This button replicates the action of the Push to Talk (PTT) switch on the microphone. When engaging the [MOX] button, or otherwise causing a transmission to be started, be certain you have either an antenna or 50-Ohm dummy load connected to the selected Antenna jack.

5. [VOX] Switch

This button enables automatic voice-actuated transmitter switching in the SSB, AM, and FM modes. While activated, the LED inside this button glows red. The controls affecting VOX operation are via the Menu item “114 TGEN V GAIN”, “115 TGEN VOX DLY”, and “116 TGEN ANTI VOX”. By proper adjustment of these controls, hands-free voice-actuated operation is possible.

6. [MONI] (Monitor) Switch

This button enables the transmit monitor in SSB, CW, AM, and FM modes. While activated, the “MONI” icon appears in the display. Adjustment of the Monitor level is accomplished using the [MONI] knob.

Advice: When using headphones, the Monitor is highly useful for making adjustments to the Parametric Equalizer or other voice quality adjustments, because the voice quality heard in the headphones is such a “natural” reproduction of the transmitted audio quality.

7. [PROC] (Processor) Switch

This button enables the Parametric Microphone Equalizer and Speech Processor for SSB/AM transmission. When the Parametric Microphone Equalizer is activated, the “MIC EQ” icon appears in the display. When the Speech Processor is activated, the “MIC EQ” and “PROC” icons appear in the display. Adjustment of the Processor level is accomplished via the Menu item “109 TGEN PROCLVL”.

Advice:

- The Speech Processor is a tool for increasing the average power output through a compression technique. However, if the Processor level is advanced too far, the increase in compression becomes counter-productive, as intelligibility will suffer. We recommend that you monitor the sound of your signal using the Monitor (with headphones).
- When the optional Data Management Unit (DMU-2000) is connected, you may use the Audio Scope/Oscilloscope page to help you adjust the setting of the compression level of the Speech Processor for optimum performance using your voice and microphone.

8. [SPOT] Switch

This button turns on the CW receiver spotting tone; by matching the SPOT tone to that

of the incoming CW signal (precisely the same pitch), you will be “zero beating” your transmitted signal on to the frequency of the other station.

The offset tone frequency will indicate at the frequency display area of the display while this button is pressed.

9. [BK-IN] Switch

This button turns the CW break-in capability on and off. While CW break-in is activated, the “BK-IN” icon appears in the display.

10. [KEYER] Switch

This button toggles the internal CW keyer on and off. While activated, the “KEYER” icon appears in the display. The Keyer sending speed is adjusted via the front panel’s [SPEED] knob and the CW Hang Time is adjusted via the Menu item “044 A1A DELAY”.

11. [AGC] Switch

This button selects the AGC characteristics for the receiver. Available selections are FAST, MID, SLOW, or AUTO, and the “AGC” icon will change according to the AGC characteristics selected.

Press the [AGC] button repeatedly to select the desired receiver-recovery time constant. Press and hold in the [AGC] button for two seconds to disable the AGC (for testing or weak-signal reception).

Advice:

- The Attenuator may be used in conjunction with the [IPO] button to provide two stages of signal reduction when an extremely strong signal is being received.
- If the AGC receiver-recovery time is set to “Off” by pressing and holding in the [AGC] button, the S-meter will no longer deflect. Additionally, you will likely encounter distortion on stronger signals, as the IF amplifiers and the following stages are probably being overloaded.

12. PHONES Jack

A 1/4-inch, 3-contact jack accepts either monaural or stereo headphones with 2- or 3-contact plugs. When a plug is inserted, the loudspeaker is disabled.

Note: When wearing headphones, we recommend that you turn the AF Gain levels down to their lowest settings before turning power on, to minimize the impact on your hearing caused by audio “pops” during switch-on.

13. [METER] Switch

This button determines the function of the meter during transmission.

Press this button to change the meter function in the transmit mode as follows:

ALC → SWR → ID → VDD → COMP → ALC

ALC: Indicates the relative ALC voltage.

SWR: Indicates the Standing Wave Ratio (Forward: Reflected).

ID: Indicates the final amplifier drain current.

VDD: Indicates the final amplifier drain voltage.

COMP: Indicates the speech compressor level (SSB modes only).

14. [MIC GAIN] Knob

This knob adjusts the microphone input level for (non-processed) SSB and AM transmission.

Advice: If you adjust the [MIC GAIN] knob while speaking in a somewhat louder than normal voice level, watch the ALC level and adjust the [MIC GAIN] knob so that the ALC reaches just to the right edge of the ALC scale. Then, when you speak in a more normal voice level, you'll be certain not to be over-driving the mic amplifier stage.

15. [SPEED] Knob

This knob adjusts the keying speed of the internal CW keyer (4 ~ 60 WPM). Clockwise rotation increases the sending speed.

When turning this knob while pressing the [KEYER] button, the frequency display shows the keying speed.

16. Microphone Connector

This 8-pin jack accepts input from a microphone utilizing a traditional YAESU HF transceiver pinout.

17. KEY Jack

This 1/4-inch, 3-contact jack accepts a CW key or keyer paddles (for the built-in electronic keyer), or output from an external electronic keyer. Pinout is shown on page ???. Key up voltage is 5 V, and key down current is 1 mA. This jack may be configured for keyer, "Bug," "straight key", or computer keying interface operation via Menu item "037 A1A F-TYPE" (see page ??). There is another jack with the same name on the rear panel, and it may be configured independently for Internal Keyer or

pseudo-straight-key operation.

Note: You cannot use a 2-contact plug in this jack (to do so produces a constant “key down” condition).

18. [MONI] Knob

This knob adjusts the audio level of the transmit RF monitor during transmission (relative to the [AF GAIN] knob), when activated by the [MONI] button.

19. [SQL] Knob

This knob sets the signal level threshold which at the receiver audio is muted, in all modes. It is very useful during local rag-chews, to eliminate noise between incoming transmissions. This control is normally kept fully counter-clockwise (off), except when scanning and during FM operation.

20. [SHIFT] Switch

Pressing this button allows you to adjust the IF DSP bandwidth using the [SELECT] knob. While activated, the LED inside this button glows orange.

21. [WIDTH] Switch

Pressing this button allows you to adjust the overall bandwidth of the IF DSP filter using the [SELECT] knob. While activated, the LED inside this button glows orange.

22. [CONT] Switch

Pressing this button allows you to select the DSP Contour filter response using the [SELECT] knob. While activated, the LED inside this button glows orange.

23. [NOTCH] Switch

Pressing this button allows you to adjust the center frequency of the IF Notch filter using the [SELECT] knob. While activated, the LED inside this button glows orange.

24. [μ -TUNE] Switch

Pressing this button allows you to adjust the center frequency of the μ -Tuning filter passband using the [SELECT] knob, when the optional RF μ Tuning Kit is connected. While activated, the LED inside this button glows orange.

25. [CLEAR] Switch

Pressing this button to reset the status of the functions which is selected from the five buttons at the left of this button to factory default.

26. [SELECT] Knob

This knob is used to adjust the status of the functions depending on the five buttons located above this knob.

FUNCTION Switch	EFFECT
SHIFT	Rotate this knob to vary the passband of the IF DSP filter by 20 Hz steps. The total adjustment range is ± 1 kHz. The position of the passband can be observed on the display.
WIDTH	Rotate this knob to set the overall bandwidth of the DSP IF filter. Counter-clockwise rotation reduces the bandwidth, while clockwise rotation increases the bandwidth. The current bandwidth can be observed on the display.
CONT	Pressing this knob to turn the CONTOUR filter on and off. Rotate this knob to select the CONTOUR filter response. The peak position of the CONTOUR filter can be observed on the display.
NOTCH	Pressing this knob to turn the IF NOTCH filter on and off. Rotate this knob to adjust the center frequency of the IF NOTCH filter. The null position of the IF NOTCH filter can be observed on the display.
μ -TUNE	Pressing this knob to turn the optional RF μ Tuning Kit on and off. Rotate this knob to adjust the center frequency of the μ -Tuning filter. The peak position of the μ -Tuning filter can be observed on the Tuning Offset Indicator field of the display.

This knob also uses to select the Menu item when the Menu mode is engaged.

Press and hold this knob for two seconds to activate the optional Voice Memory feature for the SSB/AM/FM modes, or the Contest Keyer for the CW mode. See page ?? (Voice Memory feature) or page ?? (Contest Keyer) for details.

27. [(VFO-A) RX] Indicator/Switch

This button, when pressed, the transceiver receives the VFO-A frequency. The LED inside this button will glow green when the transceiver receives the VFO-A frequency.

When the transceiver receives the VFO-A frequency, pressing this button momentarily will mute the receiver, and the indicator will blink. Pressing the button once more will restore receiver operation, and the indicator will glow green steadily.

28. QMB (Quick Memory Bank) Switches

[STO] (Store) Button

Pressing this button copies VFO-A contents (frequency, mode, bandwidth, and also repeater direction/shift frequency and CTCSS functions on the FM mode) into consecutive QMB Memories.

[RCL] (Recall) Button

Pressing this button recalls one of up to five Quick Memory Bank memories for operation.

29. [NAR] (Narrow) Switch

In the SSB/CW/RTTY/PSK modes, this button is used to set the bandwidth of the DSP (digital) IF filters to Narrow bandwidth.

Advice: You may adjust the bandwidth using the [SELECT] knob when the [WIDTH] button is engaged.

In the AM mode, this button is used to toggle the receiver's bandwidth between wide (9 kHz) and narrow (6 kHz).

In the FM mode on the 28 MHz and 50 MHz bands, this button is used to toggle the FM deviation/bandwidth between wide (± 5.0 kHz Dev./25.0 kHz BW) and narrow (± 2.5 kHz Dev./12.5 kHz BW).

30. [SPLIT] Switch

Pressing this button to activate split frequency operation between the VFO-A (used for reception) and the VFO-B (used for transmission). If you press and hold in the [SPLIT] button for two seconds, the "Quick Split" feature will be engaged, whereby the VFO-B will automatically be set to a frequency 5 kHz higher than the VFO-A frequency with same operating mode, and the transceiver will be placed in the Split mode.

31. [TXW] (TX Watch) Switch

Pressing this button lets you monitor the transmit frequency when split frequency operation is engaged. Release the button to return to normal operation.

32. [C.S] Switch

Press this button momentarily to recall a favorite Menu Selection directly.

To program a Menu selection as the short-cut, press the [MENU] button to enter the Menu, then select the Menu item you want to set as the short-cut. Now press and hold in the [C.S] button for two seconds; this will lock in the selected Menu item as the short-cut.

33. [MENU] Switch

This button is used for gaining access to the Menu system, for configuring various transceiver characteristics. Menu operation is described in detail, in this manual, beginning on page ??.

Important note: pressing this button momentarily activates the Menu, and the Menu items will appear on the display; once you are finished, you must press and hold in the [MENU] button for two seconds to save any configuration changes (momentarily pressing the [MENU] button to exit will not save the changes).

38. Main Tuning Dial Knob

This large knob adjusts the operating frequency of the VFO-A or a recalled memory. Clockwise rotation of this knob increases the frequency. Default tuning increments are 10 Hz (100 Hz in AM and FM modes); when the [FAST] button is pressed, the tuning steps increase. The available steps are:

Operating Mode	One Step*	One Dial Rotation
LSB/USB/CW/RTTY/PKT(LSB)	10 Hz (100 Hz)	10 kHz (100 kHz)
AM/FM/PKT(FM)	100 Hz (1 kHz)	100 kHz (1 MHz)

* Numbers in parentheses indicate steps when the [FAST] button is “ON”.

Advice: The tuning steps for the Main Tuning Dial knob are set, at the factory, to 10 Hz per step. Via Menu item “084 TUN DIALSTP,” however, you may change this setting from 10 Hz to 1 Hz instead. When 1 Hz basic steps are selected, the action of the [FAST] button will be changed to 1/10 of the values listed above.

39. [(VFO-A)TX] Indicator/Switch

When this button is pushed, the LED inside this button will glow red. The transceiver transmits on the VFO-A frequency (subject to any Clarifier offset, of course) when press the PTT switch.

Advice: If this indicator is not illuminated, it means that the [(VFO-B)TX] Indicator/Switch has been selected (it will be glowing red). In this case, transmission will be effected on the frequency and mode programmed for the VFO-B.

40. [FAST] Switch

Pressing this button will increase or decrease the tuning rate of the Main Tuning Dial knob (for VFO-A frequency) and the [CLA/VFO-B] knob (for VFO-B frequency) a factor of ten, as mentioned in the previous section.

When this function is activated, the “FAST” icon appears in the display.

Advice: This switch will be affects to the VFO-A and VFO-B independently.

41. [LOCK] Switch

This button toggles locking of the Main Tuning Dial knob (for VFO-A frequency tuning) and the [CLA/VFO-B] knob (for VFO-B frequency tuning). When the button is active, the Main Tuning Dial knob and [CLAR/VFO-B] knob can still be turned, but the frequency will not change, and the “LOCK” icon appears in the display.

Advice: This switch will be affects to the VFO-A and VFO-B independently.

42. [A>B] Switch

Press this button momentarily to transfer data from the VFO-A frequency (or a recalled memory channel) to the VFO-B, overwriting any previous contents in the VFO-B. Use this key to set both VFO-A and VFO-B to the same frequency and mode.

43. [A<>B] Switch

Pressing this button momentarily exchanges the contents of the VFO-A (or a recalled memory channel) and the VFO-B.

44. [V/M] Switch

This button toggles frequency control between the memory system and the VFO-A. Either “MR” or “MT” icon will be displayed to the under the frequency display field to indicate the current selection. If you have tuned off of a Memory channel frequency (“MT” icon is appeared), pressing this button returns the display to the original memory contents (“MR” icon is appeared), and pressing it once more returns operation to the VFO-A (no icon).

45. [M>A] Switch

Pressing this button momentarily displays the contents of the currently-selected memory channel for 10 seconds.

Holding this button in for two seconds copies the data from the currently-selected memory to the VFO-A, as two beeps sound. Previous data in the VFO-A will be overwritten.

46. [A>M] Switch

Pressing this button momentarily displays the contents of the currently-selected memory channel for 10 seconds.

Pressing and holding in this key for two seconds (until the double beep) copies the current operating data into the currently selected memory channel, overwriting any previous data stored there.

47. [BAND] Keys

These keys allow one-touch selection of the desired Amateur band (1.8 ~ 50 MHz).

What's more, these keys may be used for direct entry of a desired operating frequency during VFO operation.

48. MODE Switches

Pressing one of these switches selects the operating mode. Per the chart below, repeated presses of a particular switch may cause the previous mode to be selected from within a mode group (for example pressing [SSB] button repeatedly toggles between "LSB" and "USB" mode).

Switch	Variable Mode Selections
[SSB]	LSB \leftrightarrow USB
[CW]	CW(LSB) \leftrightarrow CW(USB)
[AM/FM]	AM \leftrightarrow FM
[RTTY/PKT]	RTTY(LSB) \rightarrow RTTY(USB) \rightarrow PKT(LSB) \rightarrow PKT(USB) \rightarrow PKT(FM)

49. [ATT] Switch

This button selects the degree of attenuation, if any, to be applied to the receiver input. Available selections are -6 dB, -12 dB, -18 dB, or OFF, and the selected attenuation level appears in the ATT column of the Block Diagram Display on the display.

Advice: The Attenuator may be used in conjunction with the [IPO] switch to provide two stages of signal reduction when an extremely strong signal is being received.

50. [IPO] (Intercept Point Optimization) Switch

This button may be used to set the optimum front end characteristics of the receiver circuit for a very strong-signal environment. Available selections are AMP 1 (low distortion amplifier), AMP 2 (2-stage low-distortion RF amplifier), or ON (bypasses the front end RF amplifier), and the selected receiver RF amplifier appears at the IPO column of the Block Diagram Display on the display.

51. [R.FLT] (Roofing Filter) Switch

This button selects the bandwidth of the receiver's first IF Roofing Filter. Available selections are 3 kHz, 6 kHz, 15 kHz, or Auto, and the selected bandwidth appears in

the FLT column of the Block Diagram Display on the display.

Advice: Because the roofing filter is in the first IF, the protection it provides against interference is quite significant. When set to AUTO, the SSB bandwidth is 6 kHz, while CW is 3 kHz and FM/RTTY are 15 kHz. On a crowded SSB band, however, you may wish to select the 3 kHz filter, for the maximum possible interference rejection.

52. [NB] Switch

This button turns the IF Noise Blanker on and off.

Press this button momentarily to reduce short-duration pulse noise; the “NB” icon will appear in the display.

Press and hold in this button for one second to reduce longer-duration man-made pulse noises; the “NB” icon will blink for three seconds, then will appear continuously in the display.

Press this button again to disable the noise blanker; the “NB” icon will disappear.

53. [AF GAIN] -o- [RF GAIN] Knobs

[AF GAIN] Knob

The inner [AF GAIN] knob sets the receiver’s audio volume level. Typically, you will operate with this control set between the 9 o’clock and 10 o’clock positions.

[RF GAIN] Knob

The outer [RF GAIN] knob is the receiver’s RF gain control, which adjusts the gain of the receiver’s RF and IF amplifier stages. This control is normally left in the fully clockwise position.

54. [RX CLAR] Switch

Pressing this button activates the RX Clarifier, to allow offsetting the receiving frequency temporarily. Press this button once more to return the receiver to the original frequency; the Clarifier offset will still be present, though, in case you want to use it again. To cancel the Clarifier offset, press the [CLEAR] button.

55. [TX CLAR] Switch

Pressing this button activates the TX Clarifier, to allow offsetting the transmit frequency temporarily. Press this button once more to return the transmitter to the original frequency; the Clarifier offset will still be present, though, in case you want to use it again. To cancel the Clarifier offset, press the [CLEAR] button.

56. [CLEAR] Switch

Pressing this button clears out any frequency offset you have programmed into the Clarifier register (thereby setting the offset to “Zero”).

57. [(VFO-B)RX] Indicator/Switch

This is the button that switches the receiving frequency to the VFO-B, the green LED imbedded within the button will light up. Pressing this button again will return the receiving frequency to the VFO-A, and the imbedded green LED will turn off.

58. [(VFO-B)TX] Indicator/Switch

This is the button that turns the VFO-B transmitter “On” and “Off”. When this button is pressed to transfer transmitter control to the VFO-B frequency and mode, the red LED imbedded within the button will light up. Pressing this button again will transfer frequency/mode control back to the VFO-A side, and the red LED imbedded within this button will turn off.

59. [BAND] Switch

Pressing this button allows you to select the operating band (Amateur bands) using the [CLAR/VFO-B] knob.

60. [GRP] Switch

Pressing this button allows you to select the memory group using the [CLAR/VFO-B] knob.

61. [MHz] Switch

Pressing this button allows you to tune the VFO frequency down or up in 1 MHz increments, using the [CLAR/VFO-B] knob.

62. [MCH] Switch

Pressing this button allows you to select the memory channel using the [CLAR/VFO-B] knob.

63. [CLAR/VFO-B] Knob

This knob usually tunes the Clarifier offset frequency up to ± 9.99 kHz, otherwise, this knob is used to adjust the status of the functions depending on the five buttons located around this knob.

FUNCTION Switch	EFFECT
[(VFO-B)RX] Indicator/Switch	Rotate this knob to adjust the VFO-B frequency by a same step as the Main Tuning Dial knob. The frequency display will be changed to the VFO-B frequency.
[BAND] button	Rotate this knob to select the amateur band.
[GRP] button	Rotate this knob to select the CONTOUR filter response. The peak position of the CONTOUR filter can be observed on the display.
[MHz] button	Rotate this knob to tune the VFO frequency in 1 MHz step.
[MCH] button	Rotate this knob to select the memory channel.

Display Indications

1. PROC

This indicator appears whenever the DSP Speech Processor is activated.

2. MONI

This indicator appears whenever the transmit monitor circuit is activated.

3. KEYER

This indicator appears whenever the internal CW keyer is activated.

4. BK-IN

This indicator appears whenever CW break-in operation is activated.

5. NB

This indicator appears when the receiver's "short-duration" Noise Blanker is activated. This indicator will blink for three seconds, and thereafter appears continuously, when the receiver's "longer-pulse" Noise Blanker is activated.

6. NAR

This indicator appears whenever the receiver's narrow IF DSP filter is engaged.

7. S/PO

Indicates the received signal strength, from S-0 to S-9+60dB on receiving.

Indicates the RF Power Output, from 0 to 150 Watts on transmit.

Advice: The S and PO meters can be provided the Peak-hold function via the Menu item "007 DISP PKH S" and "008 DISP PKH PO".

8. Multi Function Meter

There are five functions multi-meter. The bottom five selections in the list below are transmit functions, determined by the selections of the [METER] switch.

ALC: Indicates the relative ALC voltage.

SWR: Indicates the Standing Wave Ratio (Forward: Reflected), from 1.0 to 3.0.

ID: Indicates the final amplifier drain current, 0 to 30 ampere.

VDD: Indicates the final amplifier drain voltage (nominal value: 13.8 V).

COMP: Indicates the speech compressor level, from 0 to 30 dB.

Advice: The ALC and ID meters can be provided the Peak-hold function via the Menu item "009 DISP PKH ALC" and "010 DISP PKH ID".

9. TUNER

This indicator appears when the internal Automatic Antenna Tuner is activated.

10. HI-SWR

This indicator appears if the directional coupler and microprocessor detect an abnormally high SWR condition (over 3.0:1) that cannot be resolved by the Automatic Antenna Tuner.

Note: If this indicator appears, check to be sure that you have the correct antenna selected on the current operating band. If so, you will need to check the condition of the antenna, its coaxial cable, and/or the connectors on the cable so as to locate and correct the fault.

11. MIC EQ

This indicator appears whenever the Three-Band Parametric Microphone Equalizer is activated via the Menu.

12. REC

This indicator appears while the optional Voice Memory Unit is recording your voice message, or the Contest Keyer is recording your CW keying.

13. PLAY

This indicator appears while the optional Voice Memory Unit is playing back the recorded your voice message, or the Contest Keyer is playing back the recorded CW keying.

14. Block Diagram Display

ANT (1, 2):

Indicates the antenna selected for operation by the front panel's [ANT 1-2] button.

ATT (OFF, -6 dB, -12 dB, -18 dB):

Indicates the attenuation level selected for operation by the front panel's [AGC] button.

FLT (μ -TUNE, THRU):

Indicates the RF filter selected for operation by the front panel [μ -TUNE] button.

Advice: The μ -TUNE filter is an option. The " μ -TUNE" icon will not appear when the optional μ -TUNE unit is not connected.

IPO (AMP 1, AMP 2, ON):

Indicates the front end RF amplifier selected for operation by the front panel [IPO] button.

R.FLT

Indicates the IF Roofing Filter selected: AUTO (mode-determined), 3 kHz, 6 kHz, or 15 kHz.

AGC (AUTO, FAST, MID, SLOW):

Indicates the AGC decay time selected for operation by the front panel [AGC] switch.

15. DNR

This indicator appears whenever the Digital Noise Reduction feature is activated.

16. DNF

This indicator appears whenever the Digital Notch Filter is activated.

17. CONTOUR

The peak position of the CONTOUR Filter is depicted graphically here when the CONTOUR Filter is activated.

18. NOTCH

The null position of the IF Notch Filter is depicted graphically here when the IF Notch Filter is activated.

19. WIDTH

Indicates the bandwidth of the DSP IF filter.

20. SHIFT

Indicates the peak position of the DSP IF filter.

21. TX

This indicator appears during transmission.

22. BUSY

This indicator appears whenever the receiver squelch is open. If this indicator is not showing, and reception seems to have been lost on the receiver for no apparent reason, check the position of the [SQL] knob and rotate it fully counter-clockwise to restore reception.

23. FAST

This indicator appears when the Main Tuning Dial knob's tuning rate is set to "fast."

24. LOCK

This indicator appears when the Main Tuning Dial knob is locked.

25. LSB, USB, CW, AM, FM, RTTY, PKT

Displays the currently-selected operating mode.

26. Frequency Display

This is the frequency display.

Advice:

- When setting the Menu items, the Menu item number, Menu group name, and Menu item name will appear in this area during setup.
- When setting the CTCSS frequency for Encoding or Tone Squelch operation, the current tone information will appear in this area during setup.
- When controlling the optional rotator, the current rotation speed will appear in this area during setup.

27. Tuning Offset Indicator

This is a tuning scale that, as configured from the factory, provides a visual CW tuning indication of the incoming signal's offset from your transceiver's CW carrier frequency, as programmed by the relative clarifier offset, or the peak position of the optional

μ -TUNE filter.

28. CLAR

This indicator appears whenever the Clarifier function is activated.

29. MR

This indicator appears when the FT-950 is in the Memory Recall mode.

30. MT

This indicator appears when the FT-950 is in the Memory Tune mode to indicate that the memory contents have been temporarily changed.

31. Multi-Display Window

This window displays either the Clarifier offset or Memory Channel Number.

Advice:

- During FM operation, the Repeater Shift will be indicated in this window. A Negative frequency shift will be indicated by “-” while a Positive frequency shift will be indicated by “+.”
- When setting the Menu items, the current setting will appear in this area.
- When setting the CTCSS frequency for Encoding or Tone Squelch operation, the current repeater shift direction will appear in this area.
- When controlling the optional rotator, the antenna direction will appear in this area during setup.

Rear Panel

1. ANT 1/2 Jacks

Connect your main antenna(s) here, using a type-M (PL-259) plug and coaxial feedline for each. The internal antenna tuner affects only the antenna(s) connected here, and only during transmission.

2. DC IN Jack

This is the DC power supply connection for the transceiver. Use the supplied DC cable to connect directly to a DC power supply, which must be capable of supplying at least 22 A @13.8 VDC.

3. GND

Use this terminal to connect the transceiver to a good earth ground, for safety and optimum performance. Use a large diameter, short braided cable for making ground connections, and please refer to page ?? for other notes about proper grounding.

4. μ -TUNE Jacks

These jacks are used for signal input/output of the optional RF μ Tuning Kit.

5. ROT (ROTATOR) Jack

This 5-pin MINI-DIN Jack accepts a cable connected to a YAESU G-800DXA/1000DXA/2800DXA Antenna Rotator (listed models are current as of middle 2007). You may control the antenna azimuth rotation (and rotation speed) using the BAND buttons on the front panel.

6. LINEAR Jack

This 10-pin output jack provides band selection data which may be used for control of optional accessories such as the VL-1000 Solid-state Linear Amplifier. Pinout is shown on page ??.

7. TUNER Jack

This 8-pin output jack is used for connection to the FC-40 External Automatic Antenna Tuner. Pinout is shown on page ??.

8. RTTY/PKT Jack

This 6-pin input/output jack accepts AFSK input from a Terminal Node Controller (TNC); it also provides fixed level (100-mV @600 Ohms) receiver audio output, and FSK keying line. Pinout is shown on page ??.

9. PTT Jack

This RCA input jack may be used to provide manual transmitter activation using a footswitch or other switching device. Its function is identical to the [MOX] button on the front panel. The same line is available at the RTTY/PKT jack for TNC control. Open-circuit voltage is +13.5 VDC, and closed-circuit current is 5 mA.

10. REC Jack

This RCA jack provides low-level receiver audio output and transmit audio, for

recording or external amplification. Peak signal level is 30 mVp-p at 10 kOhms.

11. REM (REMOTE) Jack

By plugging in the optional FH-2 Remote Control Keypad to this gold-plated jack, direct access to the FT-950 CPU is provided for control functions such as contest memory keying, plus frequency and function control.

12. EXT SPKR Jack

This 3.5-mm, 2-pin jack provides variable audio output for an external loudspeaker. The audio output impedance at this jack is 4 - 8 Ohms, and the level varies according to the setting of the front panel's [AF GAIN] knob. Inserting a plug into this jack disables the internal loudspeaker.

13. KEY Jack

This 1/4-inch 3-contact jack accepts a CW key or keyer paddle. A 2-contact plug cannot be used in this jack. Key-up voltage is +5 V, and key-down current is 1 mA. Plug wiring is shown on page ??, and this jack may be configured for keyer, "Bug", "straight key", or computer keying interface operation via Menu item "039 A1A R-TYPE".

14. μ -TUNE Jack

This 10-pin mini-DIN jack used for control of the optional RF μ Tuning Kit.

15. DMU Jack

This 8-pin mini-DIN jack accepts a cable connected to an optional DMU-2000 Data Management Unit.

16. CAT Jack

This 9-pin serial DB-9 jack allows external computer control of the FT-950. Connect a serial cable here and to the RS-232C COM port on your personal computer (no external interface is required).

17. PMG-SW

This covered slide switch is used for updating the transceiver's firmware. The update software and instructions are available for download from the Vertex Standard website (<http://www.yaesu.com/>).

Basic Operation: Receiving on Amateur Bands

Before turning on main power, please verify the following items once more.

- Have you made all ground connections securely? See page ?? for details.
- Do you have your antenna(s) connected to the rear-panel Antenna jack(s)? See page ?? for details.
- Is your microphone (and/or key or paddle) connected? See page ?? for details.
- If using a linear amplifier, have all interconnections been successfully completed? See page ?? for details.
- Please rotate the [AF GAIN] control to fully counter-clockwise positions, to avoid a loud blast of audio when the transceiver turns on. See page ?? for details.

Here is the typical start-up procedure for normal operation:

1. Turn on the external DC power supply.
2. Press and hold in the front-panel [POWER] switch for two seconds to turn the transceiver on. After about five seconds (ten seconds if the optional μ Tuning Kit is connected), the transceiver is ready for full operation.
3. The transceiver will start up on 7.000.00 MHz LSB, and normal operation may begin.

Note: To turn power off, press and hold in the front panel [POWER] switch for two seconds.

4. Rotate the [AF GAIN] knob to set a comfortable audio level on incoming signals or noise. Clockwise rotation of the [AF GAIN] knob increases the volume level.

Note: When using headphones, start by rotating the [AF GAIN] knob counter-clockwise, then bring the volume level up after you put the headphones on. This will minimize the chance of damage to your hearing caused by an unexpectedly-high audio level.

5. Press the [(VFO-A)RX] Indicator/Switch to engage the VFO-A; the imbedded LED will glow green.

Advice: If you press the [(VFO-A)RX] Indicator/Switch when the imbedded LED is already glowing green, the LED will now blink “on” and “off”; this indicates that the VFO-A receiver is temporarily muted. Just press the [(VFO-A)RX] Indicator/Switch once more to restore VFO-A receiver operation.

6. Press the [BAND] button corresponding to the Amateur band on which you wish to begin operation.

Advice:

- ❑ One-touch selection of each Amateur band between 1.8 and 50 MHz is provided.
 - ❑ The FT-950 utilizes a triple band-stack VFO selection technique, which permits you to store up to three favorite frequencies and modes onto each band's VFO register. For example, you may store one frequency each on 14 MHz CW, RTTY, and USB, then recall these VFOs by successive, momentary presses of the [14] MHz band button. Each Amateur band button may similarly have up to three frequency/mode settings applied.
 - ❑ If you press the [BAND] button (imbedded LED will glow orange) located in the left of the [CLAR/VFO-B] knob, the [CLAR/VFO-B] knob may be used as a band selection knob.
 - ❑ If you press the [MHZ] button (imbedded LED will glow orange) located in the left of the [CLAR/VFO-B] knob, rotation of the [CLAR/VFO-B] knob allows frequency navigation in 1 MHz steps.
7. Press the [ANT 1-2] button to select the appropriate antenna for the band in use. Two TX/RX antennas may be connected, or one RX-only antenna.
- Advice: Once you have made your antenna selection, that antenna is “remembered” by the microprocessor in conjunction with the VFO register in use when you chose that particular antenna.
8. Press the appropriate [MODE] button to select the desired operating mode. Pressing the [SSB] button toggles the LSB and USB mode, and also pressing the [SSB] button toggles the AM and FM mode.
- Advice:
- ❑ By convention in the Amateur bands, LSB is used on the 7 MHz and lower bands (with the exception of 60 meters), while USB is utilized on the 14 MHz and higher bands.
 - ❑ When changing modes from SSB to CW, you will observe a frequency shift on the display. This shift represents the BFO offset between the “zero beat” frequency and the audible CW pitch (tone) you can hear (the pitch is programmed via the Menu item “045 A1A PITCH”), even though the actual tone that you hear is not changing. If you do not want this frequency shift to appear when changing modes from (for example) USB to CW, use the Menu item “047 A1A FRQDISP,” described on page ??.
 - ❑ When operating on the FM mode, rotate the [SQL] (Squelch) knob clockwise to the point where the background noise is just silenced. This is the point of maximum sensitivity to weak signals. Excessive advancement of the [SQL]

knob will degrade the ability of the receiver to detect weak signals.

9. Rotate the Main Tuning Dial knob to tune around the band, and begin normal operation.

Advice:

- Clockwise rotation of the Main Tuning Dial knob increases the operating frequency, one “step” of the synthesizer at a time; similarly, counter-clockwise rotation of the Main Tuning Dial knob will decrease the frequency.

Two steps, one “normal” and one “fast”, are available on each operating mode.

Pressing the [FAST] button engages the “Fast” tuning selection.

Operating Mode	1 Step	1 Dial Rotation
LSB, USB, CW, RTTY, PKT(LSB)	10Hz [100Hz]	10kHz [100kHz]
AM, FM, PKT(FM)	100Hz [1kHz]	100kHz [1MHz]

[] : [FAST] switch set to “ON”

- It is possible to separate the frequency change over one dial rotation, only while operating on the CW mode, using the Menu items “084 TUN DIALSTP” and “085 TUN CW FINE”. See page ??
- If you want to navigate quickly, so as to effect rapid frequency change, there are several techniques available:
 - Direct keyboard entry of the frequency (see page ??).
 - Use the [CLAR/VFO-B] knob to tune in 1 MHz steps (see page ??).
 - Use the microphone’s [UP]/[DWN] scanning keys, if your microphone is so equipped (see page ??).

Operation on 60-Meter (5 MHz) Band (U.S. version only)

The FT-950 includes the capability for transmission and reception on the five spot frequencies assigned to the Amateur Service in the United States. To operate on the 5 MHz band:

1. Press the [V/M] button once to enter the “Memory” mode; the “MR” icon will appear in the display and a memory channel number will appear on the Multi-Display Window in the display.

Advice: If you can not enter the “Memory” mode, check see if the green [VFO-B(RX)] Indicator/Switch is illuminated. If so, pressing the [VFO-A(RX)] Indicator/Switch will cause the green [VFO-B(RX)] Indicator/Switch to go out. Now, press the [V/M] button to enter the “Memory” mode.

2. Press the [MCH] button located on the bottom right of the [CLAR/VFO-B] knob. The LED imbedded in the button will glow orange to signify that rotation of the

[CLAR/VFO-B] knob will allow selection the memory channel.

3. Memory channels “US1” through “US5” are pre-programmed, at the factory, with the permitted frequencies in the 5 MHz band, and the USB mode is automatically selected on these channels.
4. To exit from 60-meter operation and return to the VFO mode, just press the [V/M] button.

Note: The frequencies and operating mode for 5 MHz band operation are fixed, and may not be changed.

CLAR (Clarifier) Operation (VFO-A)

The [TX CLAR], [RX CLAR], [CLEAR] buttons and [CLAR/VFO-B] knob are used to offset either the receive, transmit, or both frequencies from their settings on the VFO-A frequency (the Clarifier does not affect the VFO-B, however). The four small numbers on the Multi-Display Window show the current Clarifier offset. The Clarifier controls on the FT-950 are designed to allow you to preset an offset (up to ± 9.990 kHz) without actually retuning, and then to activate it via the Clarifier’s [RX CLAR] and [TX CLAR] buttons. This feature is ideal for following a drifting station, or for setting small frequency offsets sometimes utilized in DX “Split” work.

Here is the technique for utilizing the Clarifier:

1. Press the [RX CLAR] button. In the Multi-Display Window, the “RX” notation will appear, and the programmed offset will be applied to the receive frequency.
2. Rotation of the [CLAR/VFO-B] knob will allow you to modify your initial offset on the fly. Offsets of up to ± 9.990 kHz may be set using the Clarifier.

To cancel Clarifier operation, press the [RX CLAR] button. The “RX” notation will disappear from the display.

Advice: Turning the Clarifier off simply cancels the application of the programmed offset from the receive and/or transmit frequencies. To clear out the programmed Clarifier offset altogether, and reset it to “zero,” press the [CLEAR] button. The programmed offset is displayed in the small multi-channel window of the frequency display.

TXCLAR

Without changing the receive frequency, you may alternatively apply the Clarifier offset to the transmit frequency (typically, for “split” DX pile-ups). See page ?? for details.

The Tuning Offset Indicator provides a graphical representation of the Clarifier offset.

On CW, the Tuning Offset Indicator is used for CW Center Tuning, instead of Clarifier Offset, as the transceiver is configured at the factory. If you wish to change this, so that the Clarifier Offset is also displayed on CW, use the following procedure:

1. Press the [MENU] button to enter the Menu mode.
2. Rotate the [SELECT] knob to select Menu item “006 DISP BAR SEL”.
Advice: Press the [SELECT] knob to toggle the Menu item display between “006 DISP” and “BAR SEL”.
3. Rotate the [CLAR/VFO-B] knob to select “CLAr (Clarifier)” (replacing the default “C-tn (CW TUNING)” selection).
4. Press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation.

LOCK

You may lock the setting of the Main Tuning Dial knob (for VFO-A frequency tuning) and the [CLA/VFO-B] knob (for VFO-B frequency tuning), to prevent accidental.

To lock out the Main Tuning Dial knob and the [CLA/VFO-B] knob, just press the [LOCK] button that is located to the right of the Main Tuning Dial knob. To unlock the Dial setting, and restore normal tuning, just press the [LOCK] button once more.

DIMMER

The illumination level of the display may be adjusted via the Menu item “005 DISP DIM VFD”, if you desired.

To adjust the illumination level:

1. Press the [MENU] button to enter the Menu mode.
2. Rotate the [SELECT] knob to select Menu item “005 DISP DIM VFD”.
Advice: Press the [SELECT] knob to toggle the Menu item display between “005 DISP” and “DIM VFD”.
3. Rotate the [CLAR/VFO-B] knob to select desired illumination level.
4. Press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation.

Convenience Features

Using the VFO-B

The VFO-B works in a similar manner to the VFO-A, which you should be familiar by now. However, the VFO-B frequency selects by the [CLAR/VFO-B] knob instead of the Main Tuning Dial knob. The VFO-B provides simple split (transmit/receive) frequency operation via the combination of the green [(VFO-A)RX] Indicator/Switch, red [(VFO-A)TX] Indicator/Switch, green [(VFO-B)RX] Indicator/Switch, and red [(VFO-B)TX] Indicator/Switch or [SPLIT] button. See page ?? for details for the Split-Frequency Operation.

The frequency and mode data can be transferred from the VFO-A to the VFO-B by pressing the [A>B] button, but don't forget that this will overwrite any settings that were in the VFO-B previously. Also, the contents of the two VFOs can be swapped (with no loss of data) by pressing the [A<>B] button.

Most interference-fighting circuitry which is described later can also be used on VFO-B.

About the only things you can not do with the VFO-B (that you can with the VFO-A), are store the contents directly into a memory and set the Clarifier. For these functions you need to swap the VFO-B with the VFO-A by pressing the [A<>B] button, then store the contents into the memory or set the Clarifier.

“MY Bands” Operation

When operating on an Amateur Band, it is possible to use the [BAND] buttons to engage the use of the [CLAR/VFO-B] knob for Amateur band selection. The “My Bands” feature allows you to select several Amateur bands, and make *only* those bands available for selection via the [CLAR/VFO-B] knob.

This feature can be *very* useful in a contest, where the 10/18/24 MHz band are not used, or if you do not have antennas for some bands.

“My Bands” Setup

1. Press the [MENU] button to engage the Menu mode.
2. Rotate the [SELECT] knob to select Menu item “090 TUN MY BAND.”
Advice: Press the [SELECT] knob to toggle the Menu item display between “090 TUN” and “MY BAND”.
3. Rotate the [CLAR/VFO-B] knob to choose a band that you wish to *skip* (omit) from

the band-selection loop (when using the [CLAR/VFO-B] knob for band selection). The available choices are 1.8/3.5/5/7/10/14/18/21/24/28/50/GE (General Band).

4. Press the [ENT] button to set the omission command to ON. The “E” (Enable) notation at the right of the band notation will change to “d” (disable).
5. Repeat steps 3 and 4 to select/deselect as many bands as you like.
Note: The “ON” command sets the selected band to be *skipped*, while the “OFF” command sets the selected band to be *included* in the band-selection list. Return the “d” notation to “E” to restore operation on a previously-deleted band.
6. Press and hold in the [MENU] button for two seconds to lock in the new configuration and exit to normal operation.

Advice: The “My Band” feature affects both the VFO-A and VFO-B.

“My Band” Operation

1. Press the [BAND] button at the left of the [CLAR/VFO-B] knob; the imbedded LED will glow orange.
2. Rotate the [CLAR/VFO-B] knob to choose the Amateur band on which you wish to operate. Only those Amateur bands that have *not* been skipped will appear as you scroll through the bands.

To disable the “My Band” Operation, press the [BAND] button again; the imbedded orange LED goes out.

Advice: The “My Band” feature affects both the VFO-A and VFO-B.

Band Stack Operation

The FT-950 utilizes a triple band-stack VFO selection technique, that permits you to store up to three favorite frequencies and modes onto each band’s VFO register. For example, you may store one frequency each on 14 MHz CW, RTTY, and USB, then recall these VFOs by successive, momentary presses of the [14] MHz band button. Each Amateur band key may similarly have up to three frequency/mode settings applied. Both the VFO-A and VFO-B systems have their own, independent, band stacks.

A typical setup, for the 14 MHz band, might be arranged like this:

1. Program 14.025 MHz, CW Mode, then press the [14] MHz band button;
2. Program 14.080 MHz, RTTY Mode, then press the [14] MHz band button;
3. Program 14.195 MHz, SSB Mode, then press the [14] MHz band button.

With this configuration, successive momentary presses of the [14] MHz band button will allow you to toggle sequentially through these three VFOs.

C.S (Custom Switch)

An often-used Menu mode selection may be brought out to the front panel's [C.S] button.

C.S Setup

1. Press the [MENU] button to engage the Menu mode; the Menu list will appear on the display.
2. Rotate the [SELECT] knob to select the Menu item you want to be able to access via the [C.S] button.
Advice: Press the [SELECT] knob to toggle the Menu item display between “Menu item number and group” and “Menu Function”.
3. Press and hold in the [C.S] button for two seconds to lock in your selection.
4. Press and hold in the [MENU] button for two seconds to save the new configuration and exit to normal operation.

Menu Selection Recall via [C.S] button

Press the [C.S] button.

The programmed Menu item will appear on the display. You may now rotate the [CLAR/VFO-B] knob to change the setting of this menu item. Press and hold the [MENU] button for two seconds, when you are done, to save the new configuration and exit to normal operation.

Rotator Control Functions

When using a YAESU model G-800DXA, G-1000DXA, or G-2800DXA rotator (not supplied), it is possible to control it from the front panel of the FT-950.

1. Press and hold in the [ENT] button (one of the [BAND] Switch) for two seconds.
The frequency display area will change over to the “Rotator Control” configuration.
2. Press either the [3.5(2)] button or the [7(3)] button to rotate the antenna. Pressing the [3.5(2)] button will cause rotation to the left (counter-clockwise), while pressing the [7(3)] button will cause rotation to the right (clockwise).
3. Press the [14(5)] button or the [18(6)] button to control the speed of rotation. Pressing the [14(5)] button will cause slower rotation, while pressing the [18(6)] button will speed up rotation. Usually, you will be using the “100%” setting.

When you are through exercising rotator control, press the [ENT] button momentarily. The frequency display will return to the main display field.

Important Note:

- ❑ Set to match the starting point of your rotator control indicator needle via the Menu item “011 DISP RTR STU”. The default setting is zero (north). If your controller starting point is south, the Menu item “011 DISP RTR STU” must be set to “180”. If not set properly the FT-950 display will not show the correct direction.
- ❑ When the rotator control indicator needle does not indicate the precise antenna direction, adjusts the indicator needle precisely to the antenna direction via the Menu item “012 DISP RTR ADJ”.

More Frequency Navigation Techniques

Keyboard Frequency Entry

You may enter operating frequencies directly into the current VFO, using the front panel [BAND] buttons.

Example: Enter 14.250.00 MHz

1. Press the [ENT] button to engage the direct frequency entry process. Now, beginning with the “10 MHz” digit of the frequency (the leftmost digit), we will enter the required digits of the frequency.
2. Press, in order, the digits of the operating frequency, using the [BAND] buttons (which have the frequency-entry digit or decimal point on the right side of the slash bar). In this example, enter

[1.8/1] → [10/4] → [GEN/.] → [3.5/2] → [14/5] → [50/0] → [50/0] → [50/0] → [50/0]

The decimal point after the “MHz” portion of the frequency must be entered, but no decimal point is required after the “kHz” portion.

3. Press the [ENT] button once more. A short “beep” will confirm that the frequency entry was successful, and the new operating frequency will appear on the display.

Advice: If you attempt to enter a frequency outside the operating range of 30 kHz ~ 56 MHz, the microprocessor will ignore the attempt, and you will be returned to your previous operating frequency. If this happens, please try again, taking care not to repeat the error in the frequency entry process.

Using the [CLAR/VFO-B] knob

You may change the current VFO frequency in 1 MHz steps. If you press the [BAND] button located in the bottom left of the [CLAR/VFO-B] knob, the 1 MHz steps will be

applied to the current VFO frequency. The imbedded LED in the [BAND] button will glow orange in the latter case.

When tuning in 1 MHz steps, clockwise rotation of the [CLAR/VFO-B] knob will increase the frequency, while counter-clockwise rotation will decrease the frequency.

Using the [UP]/[DWN] buttons of the supplied MH-31B8 Hand Microphone

The [UP]/[DWN] buttons on the supplied MH-31B8 Hand Microphone may also be used for manually scanning upward or downward in frequency, respectively.

The microphone's [UP]/[DWN] buttons utilize the tuning steps of the Main Tuning Dial knob; moreover, when the microphone's [FST] button is pressed, the tuning rate increases by a factor of ten, in a manner similar to the effect of the transceiver's front-panel [FST] button.

Advice: In the AM and FM modes, you may independently set the tuning steps when using the [UP]/[DWN] buttons. To set new tuning steps, use Menu items "087 TUN AM STEP" and "088 TUN FM STEP."

Receiver Operation (Front End Block Diagram)

The FT-950 includes a wide range of special features to suppress the many types of interference that may be encountered on the HF bands. However, real world interference conditions are constantly changing, so optimum setting of the controls is somewhat of an art, requiring familiarity with the types of interference and the subtle effects of some of the controls. Therefore, the following information is provided as a general guideline for typical situations, and a starting point for your own experimentation.

The FT-950's interference-fighting circuitry begins in its "RF" stages, and continues throughout the entire receiver section. FT-950 allows configuration of the features described below.

R. FLT (IF Roofing Filters) (See page ??)

Three automatically-selected Roofing filters, in bandwidths of 15 kHz, 6 kHz, and 3 kHz, are provided in the 69 MHz First IF, right after the first mixer. These filters provide narrow-band selectivity to protect the following IF and DSP stages, and the filters' automatically-selected bandwidths may be manually changed by the operator, if desired, for special operating circumstances.

CONTOUR Filter (See page ??)

The DSP Contour filter is a unique capability providing either nulling or peaking of tunable segments of the receiver passband, so as to suppress interference or excessive frequency components on an incoming signal, or to peak those tunable frequency segments. The amount of nulling/peaking, and the bandwidth over which it is applied, are adjustable via the Menu.

IF SHIFT (See page ??)

The passband center frequency response of the IF DSP filtering may be adjusted using this control.

IF WIDTH (See page ??)

The width of the IF DSP filtering may be adjusted using this control.

IF NOTCH (See page ??)

The IF Notch filter is a high-Q notch filter that can significantly reduce, if not eliminate, an interfering carrier.

DNF (Digital Notch filter) (See page ??)

When multiple interfering carriers are encountered during reception, the Digital Notch Filter can significantly reduce the level of these signals.

DNR (Digital Noise Reduction) (See page ??)

The DSP's Digital Noise Reduction (DNR) feature utilizes sixteen different mathematical algorithms to analyze and suppress different noise profiles encountered on the HF/50 MHz bands. Choose the selection that provides the best noise suppression, which concurrently will allow the signal to rise up out of the noise.

AGC (See page ??)

The AGC system is highly adaptable to changing signal and fading characteristics, making reception possible under the most difficult conditions.

ATT

When extremely strong local signals or high noise can still degrade reception, you can use the [ATT] button to insert 6, 12, or 18-dB of RF attenuation in front of the RF amplifier.

1. Press the [ATT] button several times to set the desired attenuation level, per the chart below.

OFF: Attenuator is Off

-6 dB: The incoming signal power is reduced by 6 dB
(Signal voltage reduced by 1/2)

-12 dB: The incoming signal power is reduced by 12 dB
(Signal voltage reduced by 1/4)

-18 dB: The incoming signal power is reduced by 18 dB
(Signal voltage reduced by 1/8)

The selected attenuation level will be indicated in the ATT column of the Block Diagram Display on the display.

2. To restore full signal strength through the Attenuator circuit area, press the [ATT] button to restore the ATT display to the "OFF" position.

Advice:

- The attenuator selection will be memorized independently on each VFO stack of the VFO-A and VFO-B.
- If background noise causes the S-meter to deflect on clear frequencies, press the [ATT] button until the S-meter drops to about "S-1". This setting optimizes the trade-offs between sensitivity, noise, and interference immunity. Also, once you have tuned in a station you want to work, you may want to reduce sensitivity further (or add more attenuation) by pressing the [ATT] button to a more setting. This reduces the strength of all signals (and noise) and can make reception more comfortable, important especially during long QSOs. When looking for weak signals on a quiet band, you will want maximum sensitivity, so the IPO should be disabled and the [ATT] button should be set to "OFF." This situation is typical during quiet times on frequencies above 21 MHz, and when using a small or negative-gain receiving antenna on other bands.

μ-Tune Filter (Requires the optional RF μTuning Kit)

The RF μTuning Kit provides ultra-sharp RF selectivity for the front end of the transceiver. Very high Q is made possible by the narrow-band design. Three RF μTuning Kit are available. The MTU-160 covers the 1.8 MHz band. The MTU-80/40 covers the 3.5 and 7 MHz bands. The MTU-30/20 covers 10.1 and 14 MHz bands.

When any (or all) of the three optional units are connected, they will be automatically adjusted to center on your operating frequency.

The narrow bandwidth is especially useful on the low bands, when many strong signals are being received via NVIS propagation (Near Vertical-Incidence Signals) within a narrow bandwidth. The added protection for the RF stage is especially helpful in preventing IMD and blocking.

μ-Tune Operation

1. Press the [μ-TUNE] button. The LED inside the [μ-TUNE] button glows orange. The [SELECT] knob works as the μ-TUNING knob.
2. Press the [SELECT] knob to activate the μ-Tune filter. The tuning position of the μ-Tune filter will appear in the Tuning Offset Indicator on the display.

Advice:

- The μ-Tune circuit will automatically align itself onto your operating frequency.
 - Remember that μ-Tune only operates on the 14 MHz and lower bands.
3. Rotate the [SELECT] knob to peak the response (background noise) or reduce interference.

Advice:

- The amount of change in the center frequency of the μ-Tune filter, when rotating the [SELECT] knob by one click, can be configured using Menu item "032 GENE μT DIAL".
 - If you have performed manual adjustment of the μ-Tune filter center frequency, you may press the [CLEAR] button to re-center the filter response on your current operating frequency.
4. Press the [SELECT] knob (momentarily) once more to disengage the μ-Tune filter; the tuning position of the μ-Tune filter disappears from the Tuning Offset Indicator on the display. In this mode, only the fixed bandpass filter for the current band will be engaged.

Advice: The μ-Tune Filter selection will be memorized independently on each VFO stack of the VFO-A and VFO-B.

Advice:

- The μ-Tune filters are the most advanced, selective RF preselector filters ever incorporated into an Amateur Radio transceiver. The RF selectivity provided by μ-Tune can be of tremendous value in ensuring quiet, intermod-free reception even in the most crowded bands on a contest weekend. The μ-Tune filters provide RF

selectivity on the order of a few dozen kHz at -6 dB, at the expense of a few dB of system gain on bands where noise figure is seldom an issue. You will notice that the S-meter deflection, when μ -Tune is engaged, is slightly less than when it is out of the circuit; this is normal. If your antenna system gain is so low as to make it impossible to hear band noise when μ -Tune is engaged (highly unlikely), just switch it out, which has slightly less insertion loss.

- ❑ As you tune around on an amateur band with μ -Tune engaged, the microprocessor automatically commands the stepper motor driving the toroid core stack to center the filter on your current operating frequency. You may, however, use the [SELECT(μ -TUNE)] knob to skew the filter response to one side or the other from your operating frequency, to deal with heavy interference on one side. To re-center the μ -Tune filter on your operating frequency, and eliminate any offset, press the [CLEAR] button.

Quick Note: The permeability-tuning concept utilized in the μ -Tune circuit dates back many decades, as it was incorporated in such classic transceivers as the FT-101 and FT-901 series, in addition to the FT DX 400 and similar models. The μ -Tuning Kit uses a same circuit of our flag ship model FTDX9000 which is the highest development of this circuit concept ever employed in an Amateur transceiver.

IPO (Intercept Point Optimization)

The IPO feature allows the operator to optimize the characteristics of the receiver front end, depending on the current noise level and the strength of incoming signals.

Press the [IPO] button several times to set the desired characteristic of the receiver front end, per the chart below.

AMP1: Amplifies the incoming signal path using a low distortion RF preamplifier (gain: approx. 10 dB).

AMP2: Amplifies the incoming signal path using a 2-stage low-distortion RF preamplifier (total gain: approx. 17 dB).

ON: Bypasses the RF preamplifier, yielding direct feed to the first mixer.

The selected receiver RF preamplifier will be indicated in the IPO column of the Block Diagram Display on the display.

Advice:

- ❑ The IPO selection will be memorized independently on each VFO stack of the

VFO-A and VFO-B.

- ❑ On the 10 MHz and lower bands, it generally is not necessary to use any preamplifier at all; selecting the “ON” position described above will increase the strong-signal-handling capability of the receiver, and generally will result in more pleasant reception due to reduced noise. If you can hear band noise with the preamplifiers disengaged, then a preamplifier is generally not needed.

R.FLT (Roofing Filters)

Narrow-band Roofing Filters of 15 kHz, 6 kHz, and 3 kHz bandwidths are provided in the first IF, right after the first mixer. These filters provide protection for the 2nd mixer, DSP, and other circuitry that follow and can dramatically improve reception on a very crowded band (during a contest, etc.). Typically, the AUTO selection mode is satisfactory for most operating situations, but in an extremely crowded phone band you may wish to select, for example, the 3 kHz roofing filter for SSB operation.

Press the [R.FLT] button to toggle the Roofing Filter selection.

AUTO → 15 kHz → 6 kHz → 3 kHz → AUTO

Advice:

- ❑ As you repeatedly press the [R.FLT] button, you will observe changes in the notation in the R.FLT column of the Block Diagram Display on the display, denoting the Roofing Filter currently in use.
- ❑ Typically, this selection will be set to “AUTO.”
- ❑ The Roofing Filter selection will be memorized independently on each VFO stack of the VFO-A and VFO-B.

Quick Point:

- ❑ The “AUTO” selection of the Roofing Filter is based on the operating mode. However, you may override the automatic selection, if band conditions warrant a different (usually, a tighter) selection.
- ❑ The AUTO mode Roofing Filter selections are shown below:

AM/FM/FM-PKT	15 kHz
LSB/USB/PKT	6 kHz
CW/RTTY	3 kHz
- ❑ When the Roofing filter mode is set to “AUTO” and the Noise Blanker is turned On, the Roofing Filter bandwidth will automatically be set to 15 kHz, as this setting provides the most effective noise blanking. However, you still may override the

automatic setting, and select a more narrow Roofing Filter. Noise blanking may be compromised, however, with a tighter Roofing Filter in the line.

Terminology: A “Roofing Filter,” as its name implies, places a “Roof” over the receiver’s IF system bandwidth. This “Roof” protects the circuitry downstream from the first mixer from interference, just as a roof on a house protects the contents from rain and snow.

IF Noise Blanker (NB) Operation

The FT-950 includes an effective IF Noise Blanker, which can significantly reduce noise caused by automotive ignition systems.

1. Press the [NB] button momentarily to reduce short-duration pulse noise such as from switching transients, automobile ignitions and power lines. The “NB” icon will appear in the display to confirm that the Narrow-NB is operating. Press and hold in the [NB] button for two seconds to reduce longer-duration man-made pulse noise. The “NB” icon will blink for five seconds, and thereafter will appear continuously, to confirm that the Wide-NB is operating.
2. Adjust the Noise Blanker level via the Menu item “067 RGEN NB LVL” to the point where the offending noise is best reduced or eliminated, if desired. See box below for details.
3. To end Noise Blanker operation, press the [NB] button once more. The “NB” icon will turn off, confirming that the Noise Blanker is no longer in operation.

Advice:

- ❑ The Noise Blanker operation will be memorized independently on each VFO stack of the VFO-A and VFO-B. However, the Noise Blanker level is in common.
- ❑ When the Roofing filters mode is set to “AUTO” and the Noise Blanker is turned “ON”, the Roofing Filter bandwidth will automatically be set to “15 kHz”. The Roofing Filter may be changed to a narrower selection, as described previously, although Noise Blanker operation may be compromised somewhat when using a narrower Roofing Filter.

Adjusting the Noise Blanker Level

1. Press the [MENU] button to engage the Menu mode.
2. Rotate the [SELECT] knob to select Menu item “067 RGEN NB LVL.”

Advice: Press the [SELECT] knob to toggle the Menu item display between “067 RGEN” and “NB LVL”.

Rotate the [CLAR/VFO-B] knob to the point where the offending noise is best reduced or eliminated.

3. Press and hold in the [MENU] button for two seconds to lock in the new setting and exit to normal operation.

CONTOUR Control Operation

The Contour filtering system provides a gentle perturbation of the IF filter passband, so as to suppress or enhance certain frequency components, thus enhancing the sound and/or readability of a received signal.

1. Press the [CONT] button. The LED inside the [CONT] button glows orange. The [SELECT] knob works as Contour knob.
2. Press the [SELECT] knob to activate the Contour filter. The current “null” (or “peak”) position of the Contour filter will appear in the CONTOUR indicator on the display.
3. Rotate the [SELECT] knob to achieve the most natural-sounding audio reproduction on the incoming signal.
4. Press the [CLEAR] button to move the “null” (or “peak”) position to center.
5. To cancel Contour tuning, press the [SELECT] button once more. The graphic disappears from the CONTOUR indicator on the display, confirming that the Contour filter is no longer operation.

Advice:

- The Contour filter selection will be memorized independently on each VFO stack of the VFO-A and VFO-B.
- The Contour filter’s level (either nulling or peaking) may be adjusted using Menu item “068 RGEN CNTR LV.” The factory default setting is for a null of -15 (dB).
- The bandwidth over which the Contour filter effect is applied may be adjusted using Menu item “069 RGEN CNTR WI.” The factory default setting is 10.
- When the optional DMU-2000 Data Management Unit is connected, the Audio Scope (on the “Oscilloscope” page) is particularly useful when adjusting the Contour control. Not only can you see the effect of the null/peak of the Contour system, but you also can see the position of the null/peak with respect to frequency components of interest on the incoming signal. You may then observe (on the Audio

Scope) the effect of the Contour control while listening to the effect on the signal, and this will help build your intuition on how best to use Contour tuning in the future.

Reference to Figure (B), this show an “indentation” of the Contour filter is center of the passband. The Contour filter is placing a low-Q “notch” (per the setting of Menu item “068,” referenced above). Counter-clockwise rotation (to the left) of the [SELECT] knob causes the indentation to move toward a lower frequency within the passband, while clockwise rotation (to the right) causes the indentation to move toward a higher frequency within the passband. By removing interference or unwanted frequency components on the incoming signal, it is possible to make the desired signal rise out of the background noise/interference, enhancing intelligibility.

Quick Point: The steep slopes of the DSP filtering can, when adjusted aggressively, impart an unnatural sound to an incoming signal. Oftentimes, though, a narrow bandwidth is not the key to improving copy; the incoming signal itself may have undesirable or excessive frequency components, especially in the low-frequency range around 100-400 Hz. By judicious use of the Contour filter, the “shoulder” of the passband response may be altered, or components removed from within the passband, allowing the desired signal to rise above the background noise and interference in a manner not obtainable with other filtering systems.

IF SHIFT Operation (SSB/CW/RTTY/PKT/AM Modes)

IF SHIFT allows you to vary the DSP filter passband higher or lower, without changing the pitch of the incoming signal, so as to reduce or eliminate interference. Because the carrier tuning frequency is not varied, there is no need to re-tune the operating frequency when eliminating the interference. The total passband tuning range for the IF SHIFT system is ± 1 kHz.

1. Press the [SHIFT] button. The LED inside the [SHIFT] button glows orange. The [SELECT] knob works as the IF SHIFT knob. The center position of the IF passband appears in the SHIFT indicator on the display.
2. Rotate the [SHIFT] knob to the left or right to reduce the interference.
3. Press the [CLEAR] button to move the filter passband to center.

Advice: The center position of the IF passband will be memorized independently on

each VFO stack of the VFO-A and VFO-B.

Referring to Figure (A), note the depiction of the IF DSP filter as the thick line, with the [SELECT(SHIFT)] knob in the 12 o'clock position. In Figure (B), an interfering signal has appeared inside the original passband. In Figure (C), you can see the effect of rotating the [SELECT(SHIFT)] knob so as to reduce the interference level by moving the filter passband so that the interference is outside of the passband.

WIDTH (IF DSP Bandwidth) Tuning (SSB/CW/RTTY/PKT Modes)

The IF WIDTH tuning system allows you to vary the width of the DSP IF passband, so as to eliminate interference. Moreover, the bandwidth may actually be *expanded* from its default setting, should you wish to enhance incoming signal fidelity when interference on the band is low.

1. Press the [WIDTH] button. The LED inside the [WIDTH] button glows orange. The [SELECT] knob works as the WIDTH knob. The current bandwidth appears in the WIDTH indicator on the display.
2. Rotate the [SELECT] knob to the left or right to reduce the interference.
3. Press the [CLEAR] button to set the bandwidth to default.

Advice: The IF Bandwidth will be memorized independently on each VFO stack of the VFO-A and VFO-B.

Referring to Figure B, you can see the default bandwidth on the SSB mode by pressing the [CLEAR] button.

By rotating the [SELECT(WIDTH)] knob to the left, the bandwidth will narrow (see Figure (A)), while rotation of the [SELECT(WIDTH)] knob to the right, as depicted in Figure (C), will widen the bandwidth.

The default bandwidths, and total bandwidth adjustment range, will vary according to the operating mode:

SSB Mode: 1.8 kHz ~ 3.0 kHz (default: 2.4 kHz).

CW Mode: 500 Hz ~ 2.4 kHz (default: 2.4 kHz)

RTTY/PKT Modes: 500 Hz ~ 2.4 kHz (default: 500 Hz)

Using IF SHIFT and WIDTH Together

The IF SHIFT and Variable IF WIDTH features together form a very effective interference-fighting filtering system.

For example, in Figure “A”, you can see how interference has appeared both on the high and low sides of the desired signal. Press the [WIDTH] button then rotate the [SELECT(WIDTH)] knob, the interference from one side can be eliminated (Figure “B”). Next, press the [SHIFT] button and rotate the [SELECT(SHIFT)] knob to re-positioning the passband (Figure (C)), the interference on the opposite side can be removed, without re-introducing the interference previously eliminated in Figure “B”.

Advice: For best interference reduction, the WIDTH and SHIFT features are the primary tools you should use. After narrowing the bandwidth (WIDTH) and/or adjusting the center of the passband (SHIFT), the Contour control may also yield additional signal-enhancement benefits on the net residual bandwidth. What’s more, the IF NOTCH Filter (described later) may also be utilized, in conjunction with the three other filter systems, to significant advantage.

NARROW (NAR) One-Touch IF Filter Selection

Pressing the [NAR] button provides one-touch, mode-specific selection of a narrow IF DSP filter setting that does not depend on the setting of the [WIDTH] knob. Pressing the [NAR] button once more returns the bandwidth control to the WIDTH/SHIFT system. The factory default bandwidths are:

Operating Mode	[NAR] Switch	
	“ON”	“OFF”
SSB	200 Hz ~ 1.8 kHz* (1.8 kHz)	1.8 ~ 3.0 kHz* (2.4 kHz)
CW	100 ~ 500 Hz* (500 Hz)	500 Hz ~ 2.4 kHz* (2.4 kHz)
RTTY/PKT-L/PKT-U	100 ~ 500 Hz* (300 Hz)	500 Hz ~ 2.4 kHz* (500 Hz)
PKT-FM	9 kHz	16 kHz
AM	6 kHz	9 kHz
FM (28/50 MHz Bands)	9 kHz	16 kHz

*: Depends on the [WIDTH] knob

() : Default Bandwidth

Advice:

- When the narrow bandwidth is selected, the “NAR” icon will appear in the display.
- Even if the [NAR] button has been pressed so as to engage the narrow filter, you may adjust the IF bandwidth by rotating the [SELECT(WIDTH)] knob (requires

pressing the [WIDTH] button), and IF SHIFT still is operational (requires pressing the [SHIFT] button). For many applications, you may find that simple pressing the [NAR] button instead of adjustment of the [WIDTH] knob, may be satisfactory for interference reduction

- ❑ When you press the [NAR] button in the FM mode, both the transmit and receive bandwidths are narrowed.

IF NOTCH Filter Operation (SSB/CW/RTTY/PKT/AM Modes)

The IF NOTCH filter is a highly-effective system that allows you to slice out an interfering beat note or other carrier signal from inside the receiver passband.

1. Press the [NOTCH] button. The LED inside the [NOTCH] button glows orange. The [SELECT] knob works as Notch knob.
2. Press the [SELECT] knob to activate the Notch filter. The current “null” position of the NOTCH filter will appear in the NOTCH indicator on the display.
3. Rotate the [SELECT] knob to adjust the “null” position of the Notch filter.
4. Press the [CLEAR] button to move the “null” position to center.
5. To cancel the NOTCH filter, press the [SELECT] button once more. The graphic disappears from the NOTCH indicator on the display, confirming that the NOTCH filter is no longer operation.

Advice:

- ❑ The IF NOTCH Filter selection will be memorized independently on each VFO stack of the VFO-A and VFO-B.
- ❑ The width of the IF NOTCH null may be adjusted using Menu item “072 RGEN NOTCH W.” Both “Wide” and “Narrow” selections are available, with “Narrow” providing the least disruption of the “desired” signal.
- ❑ When the optional DMU-2000 Data Management Unit is connected, the effect of the IF NOTCH filter may be observed on the Audio Scope (on the “Oscilloscope” page). The Notch will be observed as a “dip” in the noise platform observed. What’s more, the “Waterfall” display may be used to observe the effect of the IF NOTCH filter, which will appear as a white area in the colored background area.

The performance of the IF NOTCH filter is shown in Figure (A), where the effect of rotation of the [SELECT(NOTCH)] knobs is depicted. In Figure (B) you can see the notching effect of the IF NOTCH filter as you rotate the [SELECT(NOTCH)] knobs to

eliminate the incoming interference.

Digital NOTCH Filter (DNF) Operation

The Digital NOTCH Filter (DNF) is an effective beat-cancelling filter that can null out a number of interfering beat notes inside the receiver passband. Because this is an Auto-Notch feature, there is no adjustment knob associated with this filter.

Advice: If a very strong interfering carrier is encountered, we recommend you first use the IF NOTCH filter, as it is the most effective notching tool in the receiver section.

1. Press the [MENU] button to enter the Menu mode.
2. Rotate the [SELECT] knob to select Menu item "070 RGEN DNF".
Advice: Press the [SELECT] knob to toggle the Menu item display between "070 RGEN" and "DNF".
3. Rotate the [CLAR/VFO-B] knob to select "ON". The "DNF" icon will appear in the display.
4. Press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation.

To disable the Digital NOTCH Filter, just repeat the above procedure, rotating the [CLAR/VFO-B] knob to select "OFF" in step 3 above. The "DNF" icon will turn off, confirming that the Digital NOTCH Filter is not active.

Advice: The Digital NOTCH Filter selection will be memorized independently on each VFO stack of the VFO-A and VFO-B.

Digital Noise Reduction (DNR) Operation

The Digital Noise Reduction (DNR) system is designed to reduce the level of random noise found on the HF and 50 MHz bands, and it is especially effective during SSB operation. By setting the Menu item "071 RGEN DNR", any of 15 different noise-reduction algorithms can be selected; each of these algorithms was created for dealing with a different noise profile, and you will want to experiment with the DNR system to find the best setting according to the noise currently being experienced.

1. Press the [MENU] button to enter the Menu mode.
2. Rotate the [SELECT] knob to select Menu item "071 RGEN DNR".
Advice: Press the [SELECT] knob to toggle the Menu item display between "071 RGEN" and "DNR".

3. Rotate the [CLAR/VFO-B] knob to select the setting that most effectively reduces the noise level. The “DNR” icon will appear in the display.
4. Press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation.

To disable the DNR system, just repeat the above procedure, rotating the [CLAR/VFO-B] knob to select “OFF” in step 3 above. The “DNR” icon will turn off, confirming that the DNR system is not active.

Advice: The Digital Noise Reduction will be memorized independently on each VFO stack of the VFO-A and VFO-B.

RF Gain (SSB/CW/AM Modes)

The RF Gain controls provide manual adjustment of the gain levels for the receiver RF and IF stages, to account for noise and/or signal strength conditions at the moment.

1. The [RF GAIN] knob should, initially, be rotated to the fully clockwise position. This is the point of maximum sensitivity.
2. Counter-clockwise rotation of the [RF GAIN] knob will gradually reduce the system gain.

Advice:

- ❑ As the [RF GAIN] knob is rotated counterclockwise to reduce the gain, the S-meter reading will rise. This indicates that the AGC voltage being applied to the receiver is increasing (which causes a *reduction* in receiver gain).
- ❑ Rotating the [RF GAIN] knob control to the fully counter-clockwise position will essentially disable the receiver, as the gain will be greatly reduced. In this case, as well, the S-meter will appear to be “pegged” against the right edge of the analog S-meter scale.

Quick Point:

- ❑ Reception frequently can be optimized by rotating the [RF GAIN] knob slightly counter-clockwise to the point where the incoming noise level is just about the same as the “stationary” meter needle position as set by the adjustment of the [RF GAIN] knob. This setting ensures that excessive gain is not being utilized, without so much gain reduction that incoming signals cannot be heard.
- ❑ The RF Gain control, along with the IPO and Attenuator features, all affect the

system receiver gain in different ways. As a first step in dealing with high noise or a crowded, high-level signal environment, the IPO generally should be the first feature engaged, if the frequency is low enough to allow the preamplifier to be bypassed. Thereafter, the RF Gain and Attenuator features may be employed to provide precise, delicate adjustment of the receiver gain so as to optimize performance fully.

Audio Pitch Control (SSB mode)

The FT-950 enables to adjust the receiver audio response by shifting the carrier point during the SSB operation.

1. Press the [MENU] button to enter the Menu mode.
2. Rotate the [SELECT] knob to select Menu item “065 A3J LSB CAR” or “066 A3J USB CAR”.

Advice: Press the [SELECT] knob to toggle the Menu item display between “Menu Item Number & Group Name” and “Menu Function”.

3. Rotate the [CLAR/VFO-B] knob to adjust the desired receiver audio response.
4. Press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation.

AGC (Automatic Gain Control)

The AGC system is designed to help compensate for fading and other propagation effects, with characteristics that can be of particular value on each operating mode. The basic objective of AGC is to maintain a constant audio output level once a certain minimum threshold of signal strength is achieved.

Press the [AGC] button repeatedly to select the desired receiver-recovery time constant. You will observe the AGC status notation in the AGC column of the Block Diagram Display on the display, denoting the AGC receiver-recovery time currently in use. For most operation, we recommend the “AUTO” mode. Additionally, you may disable the AGC by pressing and holding in the [AGC] button for two seconds.

Note: Pressing the [AGC] button allows selection of the desired receiver-recovery time constant. Normally, the “AUTO” selection is satisfactory for most situations, but in the event of operation on a crowded band where you wish to receive a weak signal, you may wish to change the setting (to FAST, for example). The AUTO mode selections are:

Operation Mode	AUTO AGC Selection
----------------	--------------------

LSB/USB	SLOW
CW	FAST
AM	FAST
FM	FAST
RTTY	SLOW
PKT(FM)	FAST
PKT(LSB)	SLOW

Advice:

- The AGC selection will be memorized independently on each VFO stack of the VFO-A and VFO-B.
- If the AGC receiver-recovery time is set to the “Off” by pressing and holding in the [AGC] button, the S-meter will no longer deflect. Additionally, you will likely encounter distortion on stronger signals, as the IF amplifiers and the following stages are probably being overloaded.

Quick point: Several aspects of AGC performance may be configured via the Menu. However, because AGC can have such a profound impact on overall receiver performance, we generally do not recommend any changes to the AGC Menu selections until you are thoroughly familiar with the performance of the FT-950.

Terminology: Automatic Gain Control, or AGC, is a circuit that senses the incoming signal strength, and then limits the gains of the RF and IF stages so as to keep the output audio volume at a more-or-less constant level. AGC also protects the RF, IF, Audio, and DSP stages from overload, as it limits the signal strength that is allowed to flow, irrespective of the input signal level.

Mute Feature

There may be occasions, when you want to silence the receiving audio of the FT-950 temporarily, such as to concentrate on what’s being received on the other receiver or telephone call. The Mute feature makes this simple to accomplish.

Press the [(VFO-A)RX] Indicator/Switch while receiving the VFO-A frequency or Memory channel. The FT-950 will be silenced and the green LED in the [(VFO-A)RX] Indicator/Switch will blink.

To restore reception, just press the blinking [(VFO-A)RX] Indicator/Switch once more.

While receiving the VFO-B frequency, press the [(VFO-B)RX] Indicator/Switch. The

FT-950 will be silenced and the green LED in the [(VFO-B)RX] Indicator/Switch will blink.

To restore reception, just press the blinking [(VFO-B)RX] Indicator/Switch once more.

Advice: If you press the [POWER] switch momentarily while the transceiver is turned on, the transceiver's audio will be muted for three seconds.

SSB/AM Mode Transmission

1. Press the [BAND] button corresponding to the Amateur band on which you wish to operation.
2. Press the [SSB] button for SSB operation. For AM operation press the [AM/FM] button repeatedly until the "AM" icon appears in the display.

Advice: By convention, LSB is used in the 7 MHz and lower Amateur bands for SSB communication, and USB is used on the 14 MHz and higher bands (the 10 MHz band is used for CW and data modes only).

3. Rotate the Main Tuning Dial knob to adjust the operating frequency. Alternatively, you may use the [UP]/[DWN] scanning buttons on the MH-31B8 Hand Microphone to sweep up or down the current band.
4. Press the microphone's PTT (Push To Talk) switch to begin transmission; speak into the microphone in a normal voice level.

Advice:

- The "TX" indicator will light up in the frequency display area, confirming that transmission is in progress.
 - When transmitting in the AM mode, set a maximum (carrier) power output of 25 Watts via the Menu item "112 TGEN AM CAR". See below Box for details of the setting.
5. Adjust the microphone amplifier gain to match the microphone and your voice level: press the [METER] switch repeatedly to select the "ALC" meter, close the PTT switch, and speak into the microphone in a normal voice level.
In the SSB mode, adjust the [MIC GAIN] knob so that the ALC meter stays within the ALC zone of the meter (up to half scale deflection) on voice peaks.
In the AM mode, adjust the [MIC GAIN] knob so that the ALC meter does not deflect at the voice peak.
 6. Release the PTT switch at the end of your transmission. The transceiver will return to the receive mode.

Advice:

- ❑ ALC meter deflection may be caused by excessive drive power, but also by reflected power detected in the antenna system. If the impedance presented to the transceiver is different from 50 Ohms, ALC meter action may be observed that is not related to the proper setting of the [MIC GAIN] knob. Therefore, we recommend that you make the [MIC GAIN] knob adjustments into a dummy load or antenna system presenting an impedance very close to 50 Ohms.
- ❑ You may set the desired power output via the Menu item “111 TGEN TX PWR”. The adjustment range is between 5 Watts and 100 Watts, and you should always use the minimum power necessary for maintaining reliable communications.
- ❑ When performing tests (such as the setup of the [MIC GAIN] knob), be sure to check the frequency before transmitting, so as to avoid interference to others who may already be using the frequency.
- ❑ Four techniques for exercising Transmit/Receive control are provided on the FT-950, and you may choose the technique(s) that best suit your operating needs:
 - Pressing the microphone’s PTT switch will engage the transmitter.
 - The rear panel PTT jack may be connected to a foot switch or other manual switching device in order to engage the transmitter.
 - Pressing the front panel [MOX] button will lock the transmitter on. Press the [MOX] button again to return to receive.
 - The VOX (Voice Operated Xmit) circuit will engage the transmitter automatically when you speak into the microphone. For details of VOX operation, see page ??.

Adjusting the AM Carrier

1. Press the [MENU] button to enter the Menu mode.
2. Rotate the [SELECT] knob to select Menu item “112 TGEN AM CAR”.
Advice: Press the [SELECT] knob to toggle the Menu item display between “112 TGEN” and “AM CAR”.
3. Close the PTT switch without the microphone input. rotate the [CLAR/VFO-B] knob to adjust the PO meter reading is “25 W”.
4. Press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation.

Using the Automatic Antenna Tuner

The Automatic Antenna Tuner (hereinafter referred to as the “ATU”) built into each FT-950 is crafted to ensure a 50-Ohm load for the final amplifier stage of the transmitter. We recommend that the ATU be used whenever you operate on the FT-950.

Advice:

- ❑ The ATU of the FT-950, being located inside the station, only adjusts the impedance presented to the transceiver at the station end of your coaxial cable feedline. It does not “tune” the SWR at the antenna feedpoint itself. When designing and building your antenna system, we recommend that every effort be made to ensure a low SWR at the antenna feedpoint.
- ❑ The ATU of the FT-950 includes 100 memories for tuning data. Eleven of these memories are allocated, one per Amateur band, so that each band has at least one setting preset for use on that band. The remaining 89 memories are reserved for the 89 most-recent tuning points, for quick frequency change without the need to retune the ATU.
- ❑ The ATU in the FT-950 is designed to match impedances within the range of 16.5 Ohms to 150 Ohms, corresponding to an SWR of 3:1 or less on the HF amateur bands (6 m band: 25 Ohms to 100 Ohms, corresponding to an SWR of 2:1 or less). Accordingly, simple non-resonant whip antennas, along with random-length wires and the “G5RV” antenna (on most bands) may not be within the impedance matching range of the ATU.

ATU Operation

1. Use the Main Tuning Dial knob to set the radio to the desired operating frequency within the Amateur band.
2. Press the [TUNE] button momentarily to place the ATU in the transmit line (no adjustment/tuning will occur yet). The “TUNER” icon will appear in the display.
Quick Point: The momentary press of the [TUNE] button will turn the tuner on, and the microprocessor will automatically select the tuning point closest to the current operating frequency.
3. Press and hold in the [TUNE] button for two seconds to begin automatic tuning. The transmitter will be engaged, and the “TUNER” icon will blink while tuning is in progress. When the optimum tuning point has been reached, the radio will return to receive, and the “TUNER” icon will again glow steadily (instead of

blinking).

4. While tuning around the band using the Main Tuning Dial knob, you will observe that the “TUNER” icon blinks momentarily every 10 kHz. This momentary blinking indicates that a new tuning window has been entered. If you want to save tuning data associated with this 10 kHz window, repeat step 4 (above) for each such window. On bands like 1.8 MHz where the impedance may change rapidly, the storage of a number of tuning points is recommended.
5. To disconnect the ATU from the transmit line, press the [TUNE] button momentarily. The “TUNER” icon will turn off, confirming that the ATU has been turned off. In the “Off” mode, the transceiver will be directly connected to the coaxial cable connected to your antenna, and will operate based on whatever impedance is present at the station end of the coax.

Advice: The ATU circuit is located between the final amplifier and the rear-panel antenna jack; reception is not affected by the ATU.

Quick Points:

- As shipped from the factory, only one ATU alignment point is saved on each Amateur band. This was memorized during the final alignment and performance verification stages on the production line.
- The momentary flickering of the “TUNER” icon occurs whenever you cross over into a new 10 kHz ATU memory window.

Note: Please check the operating frequency before beginning the tuning process, to be sure you are not interfering with others who may already be using the frequency.

Terminology: Antenna Tuner Memories: The microprocessor of the ATU makes a note of the positions of the tuning capacitors and the selected inductors, and stores the data for each 10 kHz window in which tuning has occurred. This eliminates the need to re-tune every time you return to a frequency on which you already have completed the tuning process.

About ATU Operation

Figure 1 depicts a situation where normal tuning via the ATU has been successfully completed, and the tuning data has been stored in the ATU memory. The antenna system as seen by the transmitter is shown.

In Figure 2, the operator has changed frequency, and the “HI SWR” icon has appeared. The operator presses and holds in the [TUNE] button for two seconds to begin impedance matching using the ATU.

If a high SWR conditions exists (above 3:1), corrective action must be taken in the antenna system to bring the impedance closer to 50 Ohms. Besides the fact that the ATU will refuse to memorize settings on frequencies where the SWR exceeds 3:1, the high SWR may indicate a mechanical failure in the feed system, and such failures can lead to the generation of spurious signals causing TVI, etc.

About ATU Memories

SWR (Post-tuning) Less than 1.5:1

The tuning settings are committed to the ATU memory.

SWR (Post-tuning) Greater than 1.5:1

Tuning data will not be retained in memory. If you return to the same frequency, the tuning process must be repeated.

SWR (Post-tuning) Greater than 3:1

The HI SWR LED will light up, and tuning settings, if achieved, will not be memorized. Please investigate and resolve the high SWR condition before attempting further operation using this antenna.

Enhancing Transmit Signal Quality

Adjusting the SSB Transmitted Bandwidth (SSB Mode)

For transmission on SSB, a default bandwidth of 2.4 kHz is provided. This bandwidth provides reasonable fidelity along with good talk power, and is typical of the bandwidth used for decades during SSB transmission. However, the bandwidth may be varied by the operator, so as to provide different levels of fidelity or talk power, according to your preferences. Here’s how to adjust the transmitted bandwidth on SSB:

1. Press the [MENU] button to engage the Menu.
2. Rotate the [SELECT] knob so as to select Menu item “064 A3J TX BPF.”
Advice: Press the [SELECT] knob to toggle the Menu item display between “064 A3J” and “TX BPF”.
3. Rotate the [CLAR/VFO-B] knob to select the desired bandwidth. The available selections are 1-30 (100-3000 Hz), 1-29 (100-2900 Hz), 2-28 (200-2800 Hz), 3-27

(300-2700 Hz), 4-26 (400-2600 Hz) , 3000WB and the default is 3-27 (300-2700 Hz). A wider bandwidth will provide greater fidelity, while a narrow bandwidth will compress the available transmitter power into less spectrum, resulting in more “talk power” for DX pile-ups.

4. Press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation.

Advice:

- ❑ The Transmit Monitor is very helpful way of verifying the effects on fidelity of changing the bandwidth. Pressing the [MONI] button then adjusting the [MONI] knob for a comfortable listening level while you are transmitting, you will be able to hear the difference in sound quality as you make changes.
- ❑ When the optional DMU-2000 Data Management Unit is connected, you may verify the effect of your adjustments of the transmitted bandwidth by observing the Audio Scope on the “Oscilloscope” page.

Quick Points:

- ❑ The higher fidelity associated with wide bandwidth will be particularly enjoyable on the low bands, during local rag-chew QSOs.
- ❑ The “3000WB” setting is a special hi-fidelity setting, whereby the transmitted bandwidth is in excess of 3 kHz. This selection, in conjunction with judicious adjustment of the Parametric Microphone Equalizer (see next chapter) can provide truly outstanding fidelity and very natural-sounding audio.
- ❑ When using the wider bandwidth selections (especially “3000WB”), the apparent power output from the transmitter may seem lower. This is because the available power from the transmitter is being distributed over a wider bandwidth, and the power detection circuitry does not compensate for the effect of the bandwidth selection (it is calibrated in the default 2.4 kHz bandwidth).

Parametric Microphone Equalizer (SSB/AM/FM mode)

The FT-950 includes a unique Three-Band Parametric Microphone Equalizer that provides precise, independent control over the low, mid and treble ranges in your voice waveform. You may utilize one group of settings when the speech processor is off, and an alternate group of settings when the speech processor is on. The speech processor feature is described in the next chapter.

Quick Point: The Parametric Equalizer is a unique technique for adjusting the signal quality. Because the three ranges may be adjusted so precisely, it is possible to craft a response that provides a more natural and pleasant sound than you have ever experienced before. Effective “talk power” can also be significantly enhanced.

The aspects of configuration that you may adjust on the Parametric Equalizer are:

Center Frequency: The center frequency of each of the three bands may be adjusted.

Gain: The amount of enhancement (or suppression) within each band may be adjusted.

Q: The bandwidth over which the equalization is applied may be adjusted.

Setup of the Parametric Microphone Equalizer

1. Connect the microphone to the MIC jack.
2. Set the RF output power to minimum value via the Menu item “111 TGEN TX PWR”, so as not to cause interference to other users during adjustment.

Advice:

- We recommend you consider connecting a dummy load to one of the Antenna jacks, and monitor your signal on a separate receiver, so as to prevent interference to other users.
 - You will have the best chance of hearing the effects of adjustments if you wear headphones (connected to the monitor receiver) while monitoring your transmitted signal.
3. To adjust the Parametric Microphone Equalizer while the speech processor is disabled, press the [PROC] button until the “MIC EQ” icon appears in the display. To adjust the Parametric Microphone Equalizer with the speech processor engaged, press the [PROC] button until the “MIC EQ” and “PROC” icons appear in the display.
 4. Press the [MONI] button, if you want to listen on the FT-950’s internal monitor.
 5. Press the [MENU] button momentarily. The Menu list will appear in the display.
 6. Rotate the [SELECT] knob to find the “EQ” Menu area, containing Menu items “091” through “100”; these parameters apply to the adjustment of the Parametric Microphone Equalizer when the speech processor is disabled. Menu items “100” through “108” apply to the adjustment of the Parametric Microphone Equalizer when the speech processor is engaged.

Advice: If you do not find the Menu item number, press the [SELECT] knob momentarily to switch the Menu item name to the Menu item number.

7. Rotate the [CLAR/VFO-B] knob to perform adjustments to a particular Menu item.
8. Close the PTT switch, and speak into the microphone while listening to the effects of the changes you are making. Because the overall effect on the sound will change with each adjustment you make, you should make several passes through each adjustment area, to be sure that you are achieving the optimum setting.
9. When you have completed all adjustments, press and hold in the [MENU] button for two seconds to save the new settings and exit to normal operation. If you only press the [MENU] button momentarily to exit, any changes you performed will not be stored.

Advice: To roll off excessive bass response in a wide-range studio microphone, try putting a 10 dB null at 100 Hz with a bandwidth of “1” or “2”, do about a 3 dB null centered on 800 Hz with a bandwidth of “3,” and then put an 8 dB peak centered on 2100 Hz with a bandwidth of “1.” These are starting recommendations; each microphone and user’s voice will be different, often requiring different settings.

Activating the Parametric Microphone Equalizer

1. Adjust the [MIC GAIN] knob for SSB use, as described on page ??.
2. Press the [PROC] button momentarily. The “MIC EQ” icon will appear in the display, confirming that the Parametric Microphone Equalizer is engaged.

Advice

A blinking “MIC ICON” icon indicates the Parametric Microphone Equalizer menu settings have all been set to “OFF” (“091 TAUD EQ1 FRQ”, “094 TAUD EQ2 FRQ”, “097 TAUD EQ3 FRQ”).

3. Press the PTT switch on the microphone, and speak into the microphone in a normal voice level.
4. To switch the Parametric Microphone Equalizer off, press the [PROC] button repeatedly until the “MIC EQ” icon disappears.

3-Stage Parametric Equalizer Adjustments (Speech Processor: “OFF”)

Center Frequency

“091 TAUD EQ1 FRQ”	“100” (Hz) ~ “700” (Hz)
“094 TAUD EQ2 FRQ”	“700” (Hz) ~ “1500” (Hz)
“097 TAUD EQ3 FRQ”	“1500” (Hz) ~ “3200” (Hz)

Parametric Gain

“092 TAUD EQ1 LVL”	“-10” (-10dB) ~ “+10” (+10dB)
“095 TAUD EQ2 LVL”	“-10” (-10dB) ~ “+10” (+10dB)
“098 TAUD EQ3 LVL”	“-10” (-10dB) ~ “+10” (+10dB)

Q (Bandwidth)

“093 TAUD EQ1 BW”	“1” ~ “10”
“096 TAUD EQ2 BW”	“1” ~ “10”
“099 TAUD EQ3 BW”	“1” ~ “10”

3-Stage Parametric Equalizer Adjustments (Speech Processor: “ON”)

Center Frequency

“100 TAUD EP1 FRQ”	“100” (Hz) ~ “700” (Hz)
“103 TAUD EP2 FRQ”	“700” (Hz) ~ “1500” (Hz)
“106 TAUD EP3 FRQ”	“1500” (Hz) ~ “3200” (Hz)

Parametric Gain

“101 TAUD EP1 LVL”	“-10” (-10dB) ~ “+10” (+10dB)
“104 TAUD EP2 LVL”	“-10” (-10dB) ~ “+10” (+10dB)
“107 TAUD EP3 LVL”	“-10” (-10dB) ~ “+10” (+10dB)

Q (Bandwidth)

“102 TAUD EP1 BW”	“1” ~ “10”
“105 TAUD EP2 BW”	“1” ~ “10”
“108 TAUD EP3 BW”	“1” ~ “10”

Using the Speech Processor (SSB and AM Modes)

The FT-950's Speech Processor is designed to increase “talk power” by increasing the average power output, (via a sophisticated compression technique) and adjusting the audio quality to the menu settings (“100 TAUD PE1 FRQ”, “103 TAUD PE2 FRQ”, “106 TAUD PE3 FRQ”). The result is improved intelligibility when conditions are difficult.

1. Adjust the [MIC GAIN] knob for SSB use, as described on page ??.
2. Press the [METER] button repeatedly to select “COMP” (Compression) meter.
3. Press the [PROC] button repeatedly until the “MIC EQ” and “PROC” icons will appear in the display, confirming that the Speech Processor is engaged.
4. Press the [PTT] switch on the microphone, and speak into the microphone in a normal voice level. Observe the deflection of the meter needle on the COMP meter scale.

5. Adjust the compression level of the Speech Processor via the Menu Item “109 TGEN PROCLVL” so that the meter needle deflects to not more than “10 dB” on the COMP meter scale. See Box at the right for details of the setting.
6. To switch the Speech Processor off, press the [PROC] button once more. The “MIC EQ” and “PROC” icons will turn off, confirming that the Speech processor is turned off.

Advice:

- ❑ Excessive advancement of the compression gain will result in a degradation of the transmitted signal’s signal-to-noise ratio, thereby reducing intelligibility at the other end of the circuit.
- ❑ The Transmit Monitor is very helpful way of verifying proper adjustment of the compression level. Pressing the [MONI] button then adjusting the [MONI] knob for a comfortable listening level while you are transmitting, you will be able to hear the difference in sound quality as you make adjustments.
- ❑ You may set the RF power output via the Menu item “111 TGEN TX PWR”, whether or not the Speech Processor is engaged.
- ❑ You may adjust the Parametric Microphone Equalizer when the speech processor is engaged, using Menu Items “100” through “108”. See page ?? for details.
- ❑ When the optional DMU-2000 Data Management Unit is connected, you may observe the effect of your compression level adjustments by viewing the wave-form on the “Oscilloscope” page.

Adjust the compression level of the Speech Processor

1. Press the [METER] button repeatedly to select “COMP” (Compression) meter.
2. Press the [MENU] button to engage the Menu.
3. Rotate the [SELECT] knob to select Menu item “109 TGEN PROCLVL.”
Advice: Press the [SELECT] knob to toggle the Menu item display between “109 TGEN” and “PROCLVL”.
4. Press the PTT switch on the microphone, and speak into the microphone in a normal voice level. Rotate the [CLAR/VFO-B] knob so that the meter deflects to not more than “10 dB” on the COMP meter scale.
5. Press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation.

Transmitter Convenience Features

Voice Memory (SSB/AM/FM modes: Requires optional DVS-XX Voice Memory Unit)

You may utilize the Voice Memory capability of the FT-950 for repetitive messages. The Voice Memory system includes five memories capable of storing up to 20 seconds of voice audio each. The maximum that any memory can hold is 20 seconds.

Recording Your Own Voice in Memory

1. Select the LSB, USB, AM, or FM mode using the front panel [MODE] buttons.
2. Press and hold the [SELECT] knob for two seconds to activate the Voice Memory Unit. Indicates one of following indication in Multi-Display Window on the display; “rEC1”, “rEC2”, “rEC3”, “rEC4”, “rEC5”, “PLY1”, “PLY2”, “PLY3”, “PLY4”, and “PLY5”.
3. Rotate the [SELECT] knob to recall the Voice Memory Channel (“rEC1” - “rEC5”) you wish to record.
4. Press the [SELECT] knob. A blinking “REC” icon will appear in the display.
5. Press the microphone’s PTT switch momentarily, the “REC” icon will glow steadily, and recording will begin. If you do not press the PTT switch within five seconds of pressing the [SELECT] knob, the memory storage process will be cancelled.
6. Speak into the microphone in a normal voice level to record the message (such as “CQ DX, CQ DX, this is W 6 Delta X-Ray Charlie, W 6 Delta X-Ray Charlie, Over”). Remember that the time limit for recording any message is 20 seconds.
7. Press the [SELECT] knob to terminate the message storage process.

Checking Your Recording

1. Be sure that the front panel [MOX] button is “Off” (the LED imbedded in the switch must be off.)
2. Press and hold the [SELECT] knob for two seconds to activate the Voice Memory Unit. Indicates one of following indication in Multi-Display Window on the display; “rEC1”, “rEC2”, “rEC3”, “rEC4”, “rEC5”, “PLY1”, “PLY2”, “PLY3”, “PLY4”, and “PLY5”.
3. Rotate the [SELECT] knob to recall the Voice Memory Channel (“PLY1” - “PLY5”) whichever one you just recorded in.
4. Press the [SELECT] knob. A “PLAY” icon will appear in the display, and you will hear the contents of the Voice Memory you just recorded.

Advice: You may adjust the playback level of the recording via Menu item “014 DVS RX LVL”.

Transmitting the Recorded Message

1. Select the LSB, USB, AM, or FM mode using the front panel [MODE] buttons.
2. Press the front panel's [BK-IN] button. A "BK-IN" icon will appear in the display.
3. Press and hold the [SELECT] knob for two seconds to activate the Voice Memory Unit. Indicates one of following indication in Multi-Display Window on the display; "rEC1", "rEC2", "rEC3", "rEC4", "rEC5", "PLY1", "PLY2", "PLY3", "PLY4", and "PLY5".
4. Rotate the [SELECT] knob to recall the Voice Memory Channel ("PLY1" - "PLY5"), depending on which memory register's message you wish to transmit.
5. Press the [SELECT] knob. A "PLYA" icon will appear in the display, and the message will be terminated.

Advice: You may adjust the transmit (audio) level of the recording via Menu item "015 DVS TX LVL".

Voice Memory Operation from the optional FH-2 Remote Control Keypad

You may also utilize the Voice Memory capability of the FT-950 from the optional FH-2 Remote Control Keypad, which plugs into the rear panel's REM jack.

Recording Your Own Voice in Memory

1. Select the LSB, USB, AM, or FM mode using the front panel [MODE] buttons.
2. Press the [MEM] key on the FH-2. A blinking "REC" icon will appear in the display.
3. Press any of the FH-2's keys numbered [1] through [5] to select that memory storage register.

Advice: If you do not press the PTT key (see next step) within five seconds, the memory storage process will be cancelled.

4. Press the microphone's PTT switch momentarily, the "REC" icon will glow steadily, and recording will begin.
5. Speak into the microphone in a normal voice level to record the message (such as "CQ DX, CQ DX, this is W 6 Delta X-Ray Charlie, W 6 Delta X-Ray Charlie, Over"). Remember that the time limit for recording any message is 20 seconds.
6. Press the FH-2's [MEM] key to terminate the message storage process.

Checking Your Recording

- Be sure that the front panel [MOX] button is "Off" (the LED imbedded in the

button must be off).

- ❑ Press the FH-2's [1] ~ [5] key (whichever one you just recorded in). You will hear the contents of the voice memory you just recorded.

Advice: You may adjust the playback level of the recording via Menu item "014 DVS RX LVL".

Transmitting the Recorded Message

- ❑ Select the LSB, USB, AM, or FM mode using the front panel [MODE] buttons.
- ❑ Press the front panel's [BK-IN] button. A "BK-IN" icon will appear in the display.
- ❑ Press the FH-2's [1] ~ [5] key (whichever one you just recorded in). The message will be terminated.

Advice: You may adjust the transmit (audio) level of the recording via Menu item "015 DVS TX LVL."

VOX (Automatic TX/RX Switching using Voice Control: SSB/AM/FM Modes)

Instead of using the microphone's PTT switch or the front panel [MOX] switch to activate the transmitter, the VOX (Voice Operated TX/RX Control) system provides hands-free, automatic activation of the transmitter, based on voice input into the microphone.

1. Press the [VOX] button to activate the VOX circuitry. The LED inside the [VOX] button glows red.
2. Without pressing the PTT switch, speak into the microphone in a normal voice level. When you start speaking, the transmitter should be activated automatically. When you finish speaking, the transceiver should return to the receive mode (after a short delay).
3. To cancel VOX and return to PTT operation, press the [VOX] button again. The LED inside the [VOX] button will disappear, signifying that the VOX circuitry has been turned off.

Advice:

- ❑ The VOX Gain may be adjusted, so as to prevent accidental transmitter activation in a noisy environment. To adjust the VOX Gain:
 - Press the [VOX] button to activate the VOX circuitry, if necessary.
 - Press the [MENU] button to engage the Menu mode.
 - Rotate the [SELECT] knob so as to select Menu item "115 TGEN V GAIN."

Advice: Press the [SELECT] knob to toggle the Menu item display between

“115 TGEN” and “V GAIN”.

- While speaking into the microphone, rotate the [CLAR/VFO-B] knob to the point where the transmitter is quickly activated by your voice, without causing background noise to activate the transmitter.
- When you have selected the optimum setting, press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation.
- The “Hang-Time” of the VOX system (the transmit-receive delay after the cessation of speech) may also be adjusted via the Menu mode. The default delay is 300 msec. To set a different delay time:
 - Press the [VOX] button to activate the VOX circuitry, if necessary.
 - Press the [MENU] button to engage the Menu.
 - Rotate the [SELECT] knob so as to select Menu item “116 TGEN VOX DLY.”
Advice: Press the [SELECT] knob to toggle the Menu item display between “116 TGEN” and “VOX DLY”.
 - Rotate the [CLAR/VFO-B] knob while saying a brief syllable like “Ah” and listening to the hang time, so as to set the desired delay.
 - When your adjustments are complete, press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation.
- The Anti-Trip setting sets the negative feedback of receiver audio to the microphone, to prevent receiver audio from activating the transmitter (via the microphone) can also be adjusted via Menu item “117 TGEN ANTIVOX”.
- VOX operation may be engaged on either Voice modes (SSB/AM/FM) and on AFSK-based Data modes. Use Menu item “114 TGEN VOX SEL” (the selections are “niC (MIC)” and “dAtA (DATA)”).

MONITOR (SSB/AM/FM modes)

You may listen to the quality of your transmitted signal using the Monitor feature.

1. Press the [MONI] button. The “MONI” icon will appear in the display, indicating that the Monitor is turned on.
2. During transmission, rotate the [MONI] knob to adjust the audio level from the Monitor. Clockwise rotation of this knob will increase the volume level.
3. To switch the Monitor off again, press the [MONI] button once more. The “MONI” icon will turn off, confirming that the Monitor is now disengaged.

Advice:

- ❑ If you are using the speaker for monitoring, instead of headphones, excessive advancement of the [MONI] knob can cause feedback to occur. Additionally, this feedback can cause the VOX system to hang up in a loop, making it impossible to return to receive. Therefore, we recommend the use of headphones, if at all possible, or the minimum usable setting of the [MONI] knob, if the speaker must be used.
- ❑ Because the Monitor feature utilizes a sampling of the transmitter's IF signal, it can be very useful for checking the adjustment of the Speech Processor or Parametric Equalizer on SSB, and for checking the general signal quality on AM and FM.

Split Operation Using the TX Clarifier (VFO-A Operation)

For split TX/RX operation in “casual” pile-ups, where the split is less than 10 kHz, the TX Clarifier (Offset Tuning) feature may be utilized.

1. Press the [TX CLAR] button. The “TX” icon will appear in the Multi-Display Window in the display.
Quick Point: The Clarifier is frequently used for receiver offset tuning. However, for DX pile-ups where the DX station is using a split of less than 10 kHz, the TX Clarifier function is usually the quickest way to set the transmitter to the desired offset frequency.
2. Rotate the [CLAR/VFO-B] knob to set the desired transmitter offset. A maximum split of ± 9.99 kHz may be set.
3. To exit from TX Clarifier operation, press the [TX CLAR] button once more. The “TX” icon will disappear from the Multi-Display Window.

Advice:

- ❑ To listen to the pile-up calling the DX station, so as to find the station currently being worked, you may press the [RX CLAR] button. Once you have zeroed in on the station calling the DX (use the SPOT function on CW for precise alignment of your frequency), you may then press the [RX CLAR] button again to cancel the RX Clarifier, and return to reception on the DX station's frequency.
- ❑ Just as with receiver Clarifier operation, the amount of offset from the original VFO frequency will appear in the small display window.
- ❑ As with receiver Clarifier operation, when you turn the TX Clarifier off the last-used offset is not lost, and will be available if you turn the TX Clarifier back on. To clear the Clarifier offset, press the [CLEAR] button.

Quick Point: When attempting to work a DX station on CW, in a split-frequency pile-up, remember that a large number of other stations may also be using Yaesu transceivers with capability similar to that of your FT-950. On the DX side of the pile-up, everyone calling precisely on the same CW frequency will sound like a single tone! So you may have more success if you use the RX Clarifier to find a *hole* in the pile-up, instead of trying to zero-beat the last station worked by the DX station.

Clarifier Offset Bar Indicator

A visual depiction of the relative offset of the Clarifier may be displayed, using the Bar Indicator.

1. Press the [MENU] button to engage the Menu mode.
2. Rotate the [SELECT] knob to select Menu item “006 DISP BAR SEL”.
Advice: Press the [SELECT] knob to toggle the Menu item display between “006 DISP” and “BAR SEL”.
3. Rotate the [SELECT] knob to select “CLAR” from the available choices; the factory default is “C-tn.”
4. Press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation.

Split-Frequency Operation

A powerful capability of the FT-950 is its flexibility in Split Frequency operation, using the VFO-A and VFO-B frequency registers. This makes the FT-950 especially useful for high-level DX-pedition use, as the Split operation capability is very advanced and easy to use.

1. Press the [(VFO-B)RX] Indicator/Switch, then rotate the [CLAR/VFO-B] knob to set the VFO-B frequency as desired.
2. Press the [(VFO-A)RX] Indicator/Switch, then rotate the Main Tuning Dial knob to set the VFO-A frequency as desired.
3. Now press the [SPLIT] button. The front panel Indicator/Switch LEDs will look like this:
 - [(VFO-A)RX] Indicator/Switch: “ON” (LED glows Green)
 - [(VFO-A)TX] Indicator/Switch: “OFF” (LED Off)
 - [(VFO-B)RX] Indicator/Switch: “OFF” (LED Off)
 - [(VFO-B)TX] Indicator/Switch: “ON” (LED glows Red)

During Split operation, the VFO-A register will be used for reception, while the VFO-B register will be used for transmission. If you press the [SPLIT] button once more, Split operation will be cancelled.

You may also press the [(VFO-A)TX] Indicator/Switch to return transmit frequency control to the VFO-A register, thereby canceling Split operation.

Advice:

- ❑ During normal (non-split) VFO-A operation, you may simply press the [(VFO-B)TX] Indicator/Switch (located on the upper right of the [CLAR/VFO-B] knob) to engage Split operation. The [(VFO-B)TX] Indicator/Switch will glow Red when you press the [(VFO-B)TX] Indicator/Switch.
- ❑ During Split operation, pressing the [A<>B] button will reverse the contents of the VFO-A and VFO-B. Press the [A<>B] button once more to return to the original frequency alignment.
- ❑ During Split operation, you may listen to the TX frequency temporarily while pressing the [TXW] button located on the bottom left of the Main Tuning Dial knob.
- ❑ It is possible to set different operating modes (for example, LSB and USB) on the two VFOs used during Split operation.
- ❑ During Split operation, it also is possible to set the VFO-A and VFO-B to different Amateur bands if you used the multi band antenna.

Quick Split Operation

The Quick Split feature allows you to set a one-touch offset of +5 kHz to be applied to your radio's VFO-B (transmit) frequency, compared to the VFO-A frequency.

1. Start with regular transceiver operation on the VFO-A.
 - [(VFO-A)RX] Indicator/Switch: "ON" (LED glows Green)
 - [(VFO-A)TX] Indicator/Switch: "ON" (LED glows Red)
 - [(VFO-B)RX] Indicator/Switch: "OFF" (LED Off)
 - [(VFO-B)TX] Indicator/Switch: "OFF" (LED Off)
2. Press and hold in the [SPLIT] button for two seconds to engage the Quick Split feature, and apply a frequency 5 kHz above the VFO-A frequency to the VFO-B frequency register. Press and hold in the [SPLIT] button for two seconds to increment the VFO-A frequency to +5 kHz.

The VFO configuration will then be:

[(VFO-A)RX] Indicator/Switch: "ON" (LED glows Green)

[(VFO-A)TX] Indicator/Switch: “OFF” (LED Off)

[(VFO-B)RX] Indicator/Switch: “OFF” (LED Off)

[(VFO-B)TX] Indicator/Switch: “ON” (LED glows Red)

Quick Points:

- ❑ The operating mode applied to the VFO-B register will be the same as that in use on the VFO-A register.
- ❑ The offset of the VFO-B from the VFO-A is programmed via the Menu, and is set to +5 kHz at the factory. Other offsets may be selected, however, using the following procedure:

1. Press the [MENU] button to engage the Menu mode.
2. Rotate the [SELECT] knob to select Menu item “030 GENE Q SPLIT”.
Advice: Press the [SELECT] knob to toggle the Menu item display between “030 GENE” and “Q SPLIT”.
3. Rotate the [SELECT] knob to select the desired offset. The available selections are -20kHz ~ +20kHz (factory default: +5 kHz).
4. Press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation.

CW Mode Operation

The powerful CW operating capabilities of the FT-950 include operation using both an electronic keyer paddle and a “straight key” or emulation thereof, as is provided by a computer-based keying device.

Setup for Straight Key (and Straight Key emulation) Operation

Before starting, connect your key line(s) to the front and/or rear panel [KEY] jack(s), and be sure the [KEYER] button on the left side of the front panel is turned off for now.

1. Press the [CW] mode button to engage CW operation. The “CW” and “USB” icons will appear in the display. And the “MONI” icon will also appear in the display; thus the CW monitor is activated.

Advice: If you press the [CW] button once more, after initially selecting CW, you will engage the “CW Reverse” mode (see page ??), whereby the “opposite” sideband injection is used, compared to the “normal” sideband. The “CW” and “LSB” icons

will appear in the display if you select CW Reverse.

2. Rotate the Main Tuning Dial knob to select the desired operating frequency.
3. Press the [BK-IN] button to engage automatic activation of the transmitter when you close the CW key. The “BK-IN” icon will appear in the display.

Advice:

- When you close your CW key, the transmitter will automatically be activated, and the CW carrier will be transmitted. When you release the key, transmission will cease after a brief delay; the delay time is user-programmable, per the discussion on page ??.
 - As shipped from the factory, the FT-950 TX/RX system for CW is configured for “Semi-break-in” operation. However, using Menu item “043 A1A BK-IN,” you may change this setup for full break-in (QSK) operation, whereby the switching is quick enough to hear incoming signals in the spaces between the dots and dashes of your transmission. This may prove very useful during contest and traffic-handling operations.
4. Operation using your CW key may now proceed.

Advice:

- You may adjust the CW sidetone level by the [MONI] knob. Rotate the [MONI] knob for a comfortable listening level on the CW sidetone. To disable the CW monitor, press the [MONI] button (the “MONI” icon is disappeared).
- If you set the [BK-IN] button to Off, you may practice your sending without having the signal go out over the air (sidetone only).
- If you reduce power via the Menu item “111 TGEN TX PWR”, the ALC meter reading will increase; this is normal and does not indicate any problem whatsoever (because increased ALC voltage is being used to lower the power).

Terminology:

- Semi-break-in

This is a pseudo-“VOX” mode used on CW, whereby the closure of the CW key will engage the transmitter, and release of the key will allow the receiver to recover after a short delay. No signals will be heard between the spaces between dots and dashes (unless the sending speed is extremely slow).

- Full break-in

Full break-in (also known as “Full QSK”) involves very fast switching between transmit and receive, such that incoming signals may be heard between the dots

and dashes as you send them. This allows you to hear a station that suddenly starts transmitting on your frequency, while you are in the midst of a transmission.

Using the Built-in Electronic Keyer

Connect the cable from your keyer paddle to the front or rear panel [KEY] jack.

1. Press the [CW] mode button to engage CW operation. The “CW” and “USB” icons will appear in the display. And the “MONI” icon will also appear in the display; thus the CW monitor is activated.

Advice: If you press the [CW] button once more, after initially selecting CW, you will engage the “CW Reverse” mode (see page ??), whereby the “opposite” sideband injection is used, compared to the “normal” sideband. The “CW” and “LSB” icons will appear in the display if you select CW Reverse.

2. Rotate the Main Tuning Dial knob to select the desired operating frequency.
3. Press the [KEYER] button. The “KEYER” icon will appear in the display, confirming that the built-in Electronic Keyer is now active.
4. Rotate the [SPEED] knob to set the desired sending speed (4 ~ 60 WPM). Clockwise rotation of the [SPEED] knob will increase the keying speed.

Advice:

- You may confirm the keying speed when turning the [SPEED] knob while pressing the [KEYER] button. The frequency display shows the keying speed temporarily.
 - When you press either the “Dot” or “Dash” side of your paddle, the CW keying tone will automatically be generated.
5. Press the [BK-IN] button to engage automatic activation of the transmitter when you press either the “Dot” or “Dash” side of your paddle. The “BK-IN” icon will appear in the display.
 6. CW operation utilizing your paddle may now commence.
 - When you utilize your keyer paddle, the transmitter will automatically be activated, and the CW characters (or a string of dots and dashes) will be transmitted. When you release the keyer paddle contacts, transmission will cease after a brief delay; the delay time is user-programmable, per the discussion on page ??.

Advice:

- You may adjust the CW sidetone level by the [MONI] knob. Rotate the [MONI]

knob for a comfortable listening level on the CW sidetone. To disable the CW monitor, press the [MONI] button (the “MONI” icon is disappeared).

- ❑ If you set the [BK-IN] button to Off, you may practice your sending without having the signal go out over the air (sidetone only).
- ❑ If you reduce power via the Menu item “111 TGEN TX PWR”, the ALC meter reading will increase; this is normal and does not indicate any problem whatsoever (because increased ALC voltage is being used to lower the power).

Full Break-in (QSK) Operation

As shipped from the factory, the FT-950 TX/RX system for CW is configured for “Semi-break-in” operation. However, using Menu item “043 A1A BK-IN,” you may change this setup for full break-in (QSK) operation, whereby the switching is quick enough to hear incoming signals in the spaces between the dots and dashes of your transmission.

1. Press the [MENU] button to engage the Menu.
2. Rotate the [SELECT] knob so as to select Menu item “043 A1A BK-IN.”
Advice: Press the [SELECT] knob to toggle the Menu item display between “043 A1A” and “BK-IN”.
3. Rotate the [CLAR/VFO-B] knob to set this Menu item to “FuLL”.
4. When your adjustments are complete, press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation.

A number of interesting and useful features are available during Electronic Keyer operation.

Setting the Keyer Weight (Dot:Dash) Ratio

The Menu may be used to adjust the Weight for the built-in Electronic Keyer. The default weighting is 3:1 (a dash is three times longer than a dot).

1. Press the [MENU] button to enter the Menu mode.
2. Rotate the [SELECT] knob to select Menu item “046 A1A WEIGHT.”
Advice: Press the [SELECT] knob to toggle the Menu item display between “046 A1A” and “WEIGHT”.
3. Rotate the [CLAR/VFO-B] knob to set the weight to the desired value. The available adjustment range is for a Dot:Dash ratio of 2.5 ~ 4.5 (default value: 3.0).
4. When you are finished, press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation.

Selecting the Keyer Operating Mode

The configuration of the Electronic Keyer may be customized independently for the front and rear KEY jacks of the FT-950. This permits utilization of Automatic Character Spacing (ACS), if desired, as well as the use of the electronic keyer via the front jack and a straight key or computer-driven keying line via the rear panel.

1. Press the [MENU] button to enter the Menu mode.
2. Rotate the [SELECT] knob to select Menu item “037 A1A F-TYPE” (for the front KEY jack) or “039 A1A R-TYPE” (for the rear-panel’s KEY jack).

Advice: Press the [SELECT] knob to toggle the Menu item display between “037 A1A” and “F-TYPE” or “039 A1A” and “R-TYPE”.

3. Rotate the [CLAR/VFO-B] knob to set the keyer to the desired mode. The available selections are:

OFF: The built-in Electronic Keyer is turned off (“straight key” mode).

buG: Dots will be generated automatically by the keyer, but dashes must be sent manually.

ELE: Both dots and dashes will be generated automatically when you use your paddle.

ACS: Same as “ELEKEY” except that the spacing between characters is precisely set by the keyer to be the same length as a dash (three dots in length)

4. When you are finished, press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation.

CW Convenience Features

CW Spotting (Zero-Beating)

“Spotting” (zeroing in on another CW station) is a handy technique for ensuring that you and the other station are precisely on the same frequency.

The Tuning Offset Indicator in the display may also be moved so you can adjust your receiver frequency to center the incoming station on the pitch corresponding to that of your transmitted signal.

Using the SPOT System

While pressing the front panel’s [SPOT] button, the Spot tone will be heard and the frequency display will show the Spot tone frequency. This tone corresponds to the pitch

of your transmitted signal, and if you adjust the receiver frequency to match the pitch of the received CW signal to that of the Spot tone, your transmitted signal will be precisely matched to that of the other station.

Release the [SPOT] button to turn the Spot tone off.

Advice:

- ❑ In a tough DX pile-up, you may actually want to use the SPOT system to find a “gap” in the spread of calling stations, instead of zeroing in precisely on the last station being worked by the DX station. From the DX side, if a dozen or more operators (also using Yaesu’s SPOT system) all call precisely on the same frequency, their dots and dashes merge into a single, long tone that the DX station cannot decipher. In such situations, calling slightly higher or lower may get your call through.
- ❑ The Tuning Offset Indicator in the display may be utilized for CW frequency adjustment, as well. Its configuration is set via Menu item “006 DISP BAR SEL” at the factory, and the Tuning Offset Indicator is already set to the “C-tn” selection.

Quick Points:

- ❑ The CW Spotting process utilizes the Spot tone or the Tuning Offset Indicator. The actual offset pitches being set by the Menu item “045 A1A PITCH” (see page ??). The offset pitch may be set to any frequency between 300 Hz and 1050 Hz, in 50 Hz steps, and you can either match tones audibly (using the [SPOT] button) or align the receiver frequency so that the central red LED on the Tuning Offset indicator lights up. Note that there are 21 “dots” on the Tuning Offset Indicator, and depending on the resolution selected, the incoming CW signal may fall outside the visible range of the bar indicator, if you are not reasonably close to the proper alignment of tones.
- ❑ The displayed frequency, on CW, normally reflects the “zero beat” frequency of your offset carrier. That is, if you were to listen on USB on 14.100.00 MHz to a signal with a 700 Hz offset, the “zero beat” frequency of that CW carrier would be 14.000.70 MHz; the latter frequency is what the FT-950 displays, by default. However, you can change the display to be identical to what you would see on SSB by using Menu item “047 A1A FRQDISP” and setting it to “dIr” instead of its default “OFSt” setting.

Using CW Reverse

If you experience a difficult interference situation, where an interfering station cannot readily be eliminated, you may wish to try receiving using the opposite sideband. This may throw the interfering station's frequency in a direction that may lend itself more readily to rejection.

1. To start, let's use a typical example where you have set the CW mode (using the default "USB" injection).
2. Now be sure your mode selection is still set for the VFO-A, and press the [CW] mode button once more. The "CW" and "LSB" icons will appear in the display, indicating that the "LSB" injection side has now been selected.
3. Press the [CW] mode button once more to return to the normal (USB) injection side and cancel CW Reverse operation (the "CW" and "USB" icons will appear in the display).

In the illustration, Figure A demonstrates the normal CW injection setup, using the USB side. In Figure B, CW Reverse has been engaged, so as to receive using LSB-side injection to eliminate interference.

The beneficial effect of switching sidebands can clearly be seen in this example.

Notes:

- When CW Reverse is engaged, the Tuning Offset Indicator action will concurrently be reversed as to its indication.
- When the incoming signal pitch tone is properly aligned, the central red marker lights up whether or not CW Reverse is engaged.

CW Delay Time Setting

During semi-break-in (not QSK) operation, the hang time of the transmitter, after you have finished sending, may be adjusted to a comfortable value consistent with your sending speed. This is the functional equivalent to the "VOX Delay" adjustment used on voice modes, and the delay may be varied anywhere between 30 msec and 3 seconds via the Menu item "044 A1A DELAY".

1. Press the [BK-IN] button to enable CW transmission (Menu item "043 A1A BK-IN" must be set to "SEni").
2. Press the [MENU] button to enter the Menu mode.

3. Rotate the [SELECT] knob to select Menu item “044 A1A DELAY”.
Advice: Press the [SELECT] knob to toggle the Menu item display between “044 A1A” and “DELAY”.
4. Start sending, rotate the [CLAR/VFO-B] knob so that the hang time is as you prefer for comfortable operation.
5. When you are finished, press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation.

CW Pitch Adjustment

You may allow adjustment of the center frequency of the receiver passband, as well as the pitch of your offset CW carrier, to the tone you prefer via the Menu item “045 A1A PITCH”. The tone may be varied between 300 Hz and 1050 Hz, in 50 Hz steps.

1. Press the [MENU] button to enter the Menu mode.
2. Rotate the [SELECT] knob to select Menu item “045 A1A PITCH”.
Advice: Press the [SELECT] knob to toggle the Menu item display between “045 A1A” and “PITCH”.
3. Rotate the [CLAR/VFO-B] knob to select the desired tone.
4. When you are finished, press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation.

Advice: You may confirm the Spot tone frequency when pressing the [SPOT] button. The frequency display will shows the Spot tone frequency.

Terminology: CW Pitch: If you tuned to an exact “zero beat” on an incoming CW signal, you could not copy it (“Zero beat” implies a 0 Hz tone). Therefore, the receiver is offset several hundreds of Hz (typically), so as to allow your ear to detect the tone. The BFO offset associated with this tuning (that produces the comfortable audio tone) is called the CW Pitch.

Contest Memory Keyer

The FT-950 is capable of the automatic sending of CW messages (as you might do in a contest). Two techniques for message storage are available: you may either send the desired message contents using your keyer paddle (“Message Memory”), or you may input the text characters using the Main Dial Tuning knob and [CLAR/VFO-B] knobs (“Text Memory”).

Message Memory

Five memory channels capable of retaining 50 characters total are provided (using the PARIS standard for characters and word length).

Example: CQ CQ CQ DE W6DXC K (19 characters)

Terminology:

PARIS Word Length: By convention in the Amateur industry (utilized by ARRL and others), the length of one “word” of CW is defined as the length of the Morse Code characters spelling the word “PARIS.” This character (dot/dash/space) length is used for the rigorous definition of code speed in “words per minute.”

Storing a Message into Memory

1. Press the [MENU] button to enter the Menu mode.
2. Rotate the [SELECT] knob to select the CW Memory Register which you wish to store the message; for now, we are just selecting the message entry technique (Keyer entry).

019 KEY CW MEM1
020 KEY CW MEM2
021 KEY CW MEM3
022 KEY CW MEM4
023 KEY CW MEM5

Advice: Press the [SELECT] knob to toggle the Menu item display between “Menu Item Number & Group Name” and “Menu Function”.

3. Rotate the [CLAR/VFO-B] knob to set the selected CW Memory Register to “tyP2.” If you want to use your keyer paddle for message entry on all memories, set all five Menu items (#019 ~ 023) to “tyP2.”
4. Press and hold in the [MENU] button for two seconds to save the new settings and exit.

Message Memory Programming (Using your Paddle)

1. Press the [CW] button to set the operating mode to CW.
2. Be sure that the Break-in is “Off” by pressing the [BK-IN] button.
3. Turn the internal Electronic Keyer “On” by pressing the [KEYER] button, if necessary.
4. Press and hold the [SELECT] knob for two seconds to activate the Contest Memory

Keyer. Indicates one of following indication in Multi-Display Window on the display; “rEC1”, “rEC2”, “rEC3”, “rEC4”, “rEC5”, “PLY1”, “PLY2”, “PLY3”, “PLY4”, and “PLY5”.

5. Rotate the [SELECT] knob to select the CW Memory Register (“rEC1” through “rEC5”) which you wish to store the message.
6. Press the [SELECT] knob. A blinking “REC” icon will appear in the display.
7. Send the desired message using your keyer paddle, the “REC” icon will glow steadily, and recording will begin.

Advice: If you do not keying within five seconds of pressing the [SELECT] knob, the memory storage process will be cancelled.

8. Press the [SELECT] knob once more at the end of your message. Up to 50 characters may be stored among the five memories.

Note: you must exercise care in sending to ensure that the spaces between letters and words are accurately done; if your timing is off, the spacing may not come out right in the stored message.

For ease in setting up the keyer memories, we recommend you set Menu item “037 A1A F-TYPE” and/or “039 A1A R-TYPE” to “ACS” (Automatic Character Spacing) while you are programming the keyer memories.

Checking the CW Memory Contents

1. Be sure that Break-in is still turned “Off” by the [BK-IN] button.
2. Press the [MONI] button to enable the CW monitor. A “MONI” icon will appear in the display.
3. Press and hold the [SELECT] knob for two seconds to activate the Contest Memory Keyer. Indicates one of following indication in Multi-Display Window on the display; “rEC1”, “rEC2”, “rEC3”, “rEC4”, “rEC5”, “PLY1”, “PLY2”, “PLY3”, “PLY4”, and “PLY5”.
4. Rotate the [SELECT] knob to select the CW Memory Register (“PLY1” through “PLY5”) which you wish to check the message.
5. Press the [SELECT] knob momentarily. A “PLAY” icon will appear in the display and you will hear the results in the sidetone, but no RF energy will be transmitted.

Note: Adjust the monitor level using the [MONI] knob.

On-The-Air CW Message Playback

1. Press the [BK-IN] button to enable transmission. Either Full- or Semi-break-in will be engaged, depending on the setting of Menu item “043 A1A BK-IN.”

2. Press and hold the [SELECT] knob for two seconds to activate the Contest Memory Keyer. Indicates one of following indication in Multi-Display Window on the display; “rEC1”, “rEC2”, “rEC3”, “rEC4”, “rEC5”, “PLY1”, “PLY2”, “PLY3”, “PLY4”, and “PLY5”.
3. Rotate the [SELECT] knob to select the CW Memory Register (“PLY1” through “PLY5”) which you wish to transmit.
4. Press the [SELECT] knob momentarily. A “PLAY” icon will appear in the display and transmit the programmed message on the air.

Note: If you subsequently decide to use the “Text Memory” technique for memory storage, please note that the contents of a message stored using keyer paddle input will not be transferred over when you select “Text Memory technique” on a particular memory register (the Menu Mode Setting is set to “tyP1”).

Transmitting in the Beacon Mode

It is possible to transmit, repetitively in a “Beacon” mode, any message programmed either via paddle input or via the “Text” input method. The time delay between message repeats may be set anywhere between 1 and 255 seconds via Menu item “016 KEY BEACON”. If you do not wish the message to repeat in a “Beacon” mode, please set this Menu item to “OFF.”

To transmit the message:

1. Press and hold the [SELECT] knob for two seconds to activate the Contest Memory Keyer. Indicates one of following indication in Multi-Display Window on the display; “rEC1”, “rEC2”, “rEC3”, “rEC4”, “rEC5”, “PLY1”, “PLY2”, “PLY3”, “PLY4”, and “PLY5”.
2. Rotate the [SELECT] knob to select the CW Memory Register (“PLY1” through “PLY5”) which the Beacon message is stored.
3. Press the [SELECT] knob. Repetitive transmission of the Beacon message will begin. Press one of these keys once more to halt the Beacon transmissions.

TEXT Memory

The five channels of CW message memory (up to 50 characters total) may also be programmed using a text-entry technique. This technique is somewhat slower than when you send the message directly from your keyer paddle, but accuracy of character spacing is ensured.

Example 1: CQ CQ CQ DE W6DXC K (20 characters)

And we will utilize another powerful feature of the CW Memory Keyer, the sequential

Contest Number (“Countup”) feature.

Example 2: 599 10 200 # K (15 characters)

Storing a Message into Memory

1. Press the [MENU] button to enter the Menu mode.
2. Rotate the [SELECT] knob to select the CW Memory Register into which you wish to store the message; for now, we are just selecting the message entry technique (Keyer entry).

019 KEY CW MEM1

020 KEY CW MEM2

021 KEY CW MEM3

022 KEY CW MEM4

023 KEY CW MEM5

Advice: Press the [SELECT] knob to toggle the Menu item display between “Menu Item Number & Group Name” and “Menu Function”.

3. Rotate the [CLAR/VFO-B] knob to set the selected CW Memory Register to “tyP1.” If you want to text message entry on all memories, set all five Menu items (#019 ~ 023) to “tyP1.”
4. Press and hold in the [MENU] button for two seconds to save the new settings and exit.

Text Message Programming

1. Press the [CW] button to set the operating mode to CW.
2. Be sure that the Break-in is “Off” by pressing the [BK-IN] button, if necessary.
3. Press and hold the [SELECT] knob for two seconds to activate the Contest Memory Keyer. Indicates one of following indication in Multi-Display Window on the display; “rEC1”, “rEC2”, “rEC3”, “rEC4”, “rEC5”, “PLY1”, “PLY2”, “PLY3”, “PLY4”, and “PLY5”.
4. Rotate the [SELECT] knob to select the Memory Register (“rEC1” through “rEC5”) which you wish to program the text.
5. Press the [SELECT] knob. A “REC” icon will appear in the display.
6. Use the Main Tuning Dial knob to set the cursor position and use the [CLAR/VFO-B] knob to choose the letter/number to be programmed in each slot of the memory. In the case of the second example above, the “#” character designates the slot where the Contest Number will appear.
7. When the message is complete, add the “}” character at the end to signify the

termination of the message.

8. Press and hold in the [SELECT] button for two seconds to exit, once all characters (including “}”) have been programmed.

Advice: Momentarily pressing the [SELECT] button is canceling the programming.

Deleting Previously-stored Characters

Use the Main Tuning Dial knob to select the last correct letter in the message. Now rotate the [CLAR/VFO-B] knob to select the “}” character; everything after the “}” character will be deleted.

Checking the CW Memory Contents

1. Be sure that Break-in is still turned “Off” by the [BK-IN] button.
2. Press the [MONI] button to enable CW monitor. A “MONI” icon will appear in the display.
3. Press and hold the [SELECT] knob for two seconds to activate the Contest Memory Keyer. Indicates one of following indication in Multi-Display Window on the display; “REC1”, “REC2”, “REC3”, “REC4”, “REC5”, “PLY1”, “PLY2”, “PLY3”, “PLY4”, and “PLY5”.
4. Rotate the [SELECT] knob to select the CW Memory Register (“PLY1” through “PLY5”) whichever one you just recorded in.
5. Press the [SELECT] knob. A “PLAY” icon will appear in the display, and you will hear the results in the sidetone, but no RF energy will be transmitted.

Note: Adjust the monitor level using the [MONI] knob.

On-The-Air CW Message Playback

1. Press the [BK-IN] button to enable transmission. Either Full- or Semi-break-in will be engaged, depending on the setting of Menu item “043 A1A BK-IN.”
2. Press the [MONI] button to enable CW monitor. A “MONI” icon will appear in the display.
3. Press and hold the [SELECT] knob for two seconds to activate the Contest Memory Keyer. Indicates one of following indication in Multi-Display Window on the display; “rEC1”, “rEC2”, “rEC3”, “rEC4”, “rEC5”, “PLY1”, “PLY2”, “PLY3”, “PLY4”, and “PLY5”.
4. Rotate the [SELECT] knob to select the CW Memory Register (“PLY1” through “PLY5”) which you wish to transmit.
5. Press the [SELECT] knob. A “PLAY” icon will appear in the display, and transmit

the programmed message on the air.

Note: If you subsequently decide to use the “Message Memory” technique for memory storage, please note that the contents of a message stored using text input will not be transferred over when you select “Message Memory technique” on a particular memory register (the Menu Mode Setting is set to “tyP2”).

Contest Number Programming

Use this process if you are starting a contest, or of you somehow get out of sync with the proper number in the middle of a contest.

1. Press the [MENU] button to enter the Menu mode.
2. Rotate the [SELECT] knob to select Menu item “018 KEY CONTEST.” The current contest number appears in the Multi-Display Window on the display.
Advice: Press the [SELECT] knob to toggle the Menu item display between “018 KEY” and “CONTEST”.
3. Rotate the [CLAR/VFO-B] knob to set the Contest Number to the desired value.
Advice: Press the [CLEAR] button (located at the upper right of the [SELECT] knob) to reset the Contest Number to “1”.
4. Press and hold the [MENU] button for two seconds more to store the new number and exit.

Contest Memory Keyer (Using the optional FH-2 Remote Control Keypad)

You may also utilize the CW message capability of the FT-950 from the optional FH-2 Remote Control Keypad, which plugs into the rear panel’s REM jack.

Message Memory

Five memory channels capable of retaining 50 characters total are provided (using the PARIS standard for characters and word length).

Example: CQ CQ CQ DE W6DXC K (19 characters)

Storing a Message into Memory

1. Press the [MENU] button to enter the Menu mode.
2. Rotate the [SELECT] to select the CW Memory Register into which you wish to store the message; for now, we are just selecting the message entry technique (Keyer entry).
019 KEY CW MEM1
020 KEY CW MEM2

021 KEY CW MEM3

022 KEY CW MEM4

023 KEY CW MEM5

Advice: Press the [SELECT] knob to toggle the Menu item display between “Menu Item Number & Group Name” and “Menu Function”.

3. Rotate the [CLAR/VFO-B] knob to set the selected CW Memory Register to “tyP2.”
If you want to text message entry on all memories, set all five Menu items (#019 ~ 023) to “tyP2.”
4. Press and hold in the [MENU] button for two seconds to save the new settings and exit.

Message Memory Programming (Using Your Paddle)

1. Set the operating mode to CW.
2. Set the [BK-IN] button to “Off”.
3. Turn the internal Electronic Keyer “On” by pressing the [KEYER] button, if necessary.
4. Press the [MEM] key on the FH-2. A blinking “REC” icon will appear in the display.
5. Press any of the FH-2’s keys numbered [1] through [5] to begin the memory storage process, and the “REC” icon will glow steadily.
6. Send the desired message using your keyer paddle.

Advice: If you do not keying within ten seconds, the memory storage process will be cancelled.

7. Press the [MEM] key on the FH-2 once more at the end of your message. Up to 50 characters may be stored among the five memories.

Note: you must exercise care in sending to ensure that the spaces between letters and words are accurately done; if your timing is off, the spacing may not come out right in the stored message.

For ease in setting up the keyer memories, we recommend you set Menu item “037 A1A F-TYPE” and/or “039 A1A R-TYPE” to “ACS” (Automatic Character Spacing) while you are programming the keyer memories.

Checking the CW Memory Contents

1. Be sure that Break-in is still turned “Off” by the [BK-IN] button.
2. Press the [MONI] button to enable the CW monitor. A “MONI” icon will appear in the display.

3. Press the FH-2's [1] ~ [5] key whichever one you just recorded in. A "PLAY" icon will appear in the display, and you will hear the results in the sidetone, but no RF energy will be transmitted.

Note: You may adjust the monitor level using the [MONI] knob.

On-The-Air CW Message Playback

1. Press the [BK-IN] button to enable transmission. Either Full- or Semi-break-in will be engaged, depending on the setting of Menu item "043 A1A BK-IN."
2. Press the FH-2's [1] ~ [5] key, depending on which CW Memory Register's message you wish to transmit. A "PLAY" icon will appear in the display, and transmit the programmed message on the air.

Note: If you subsequently decide to use the "Text Memory" technique for memory storage, please note that the contents of a message stored using keyer paddle input will not be transferred over when you select "Text Memory technique" on a particular memory register (the Menu Mode Setting is set to "tyP1").

TEXT Memory

The five channels of CW message memory (up to 50 characters total) may also be programmed using a text-entry technique. This technique is somewhat slower than when you send the message directly from your keyer paddle, but accuracy of character spacing is ensured.

Example 1: CQ CQ CQ DE W6DXC K (20 characters)

And we will utilize another powerful feature of the CW Memory Keyer, the sequential Contest Number ("Countup") feature.

Example 2: 599 10 200 # K (15 characters)

Text Memory Storage

1. Press the [MENU] button to enter the Menu mode.
2. Rotate the [SELECT] to select the CW Memory Register into which you wish to store the message; we are now selecting the message entry technique (Text entry).

019 KEY CW MEM1

020 KEY CW MEM2

021 KEY CW MEM3

022 KEY CW MEM4

023 KEY CW MEM5

Advice: Press the [SELECT] knob to toggle the Menu item display between "Menu

Item Number & Group Name” and “Menu Function”.

3. Rotate the [CLAR/VFO-B] knob to set the selected CW Memory Register to “tyP1.”
If you want to text message entry on all memories, set all five Menu items (#019 ~ 023) to “tyP1.”
4. Press and hold in the [MENU] button for two seconds to save the new settings and exit.

Text Message Programming

1. Press the [CW] button to set the operating mode to CW.
2. Be sure that Break-in is “Off” by pressing the [BK-IN] button, if necessary.
3. Press the FH-2’s [MEM] key. A blinking “REC” icon will appear in the display.
4. Press the FH-2’s [1] ~ [5] key to select the desired CW Memory Register into which you wish to program the text, the “REC” icon will glow steadily.
5. Use the FH-2’s [◀] and [▶] keys to set the cursor position and use the FH-2’s [▲] and [▼] keys to choose the letter/number to be programmed in each slot of the memory. In the case of the second example above, the “#” character designates the slot where the Contest Number will appear.

Advice: You may also use the Main Tuning Dial knob and the [CLAR/VFO-B] knobs to program the message characters.

6. When the message is complete, add the “}” character at the end to signify the termination of the message.
7. Press and hold in the FH-2’s [MEM] key for two seconds to exit, once all characters (including “}”) have been programmed.

Advice:

Deleting Previously-stored Characters

Use the FH-2’s [◀] and [▶] keys or Main Tuning Dial knob to select the last correct letter in the message. Now use the FH-2’s [▲] and [▼] keys or rotate the [CLAR/VFO-B] knob to select the “}” character; everything after the “}” character will be deleted.

Checking the CW Memory Contents

1. Be sure that the Break-in is still turned “Off” by the [BK-IN] key.
2. Press the [MONI] button to enable the CW monitor. A “MONI” icon will appear in the display.
3. Press the FH-2’s [1] ~ [5] key whichever one you just recorded in. A “PLAY” icon

will appear in the display, and you will hear the results in the sidetone, but no RF energy will be transmitted.

Note: You may adjust the monitor level using the [MONI] knob.

On-The-Air CW Message Playback

1. Press the [BK-IN] button to enable transmission. Either Full- or Semi-break-in will be engaged, depending on the setting of Menu item "043 A1A BK-IN."
2. Press the FH-2's [1] ~ [5] key, depending on which CW Memory Register's message you wish to transmit. A "PLAY" icon will appear in the display, and transmit the programmed message on the air.

Note: If you subsequently decide to use the "Message Memory" technique for memory storage, please note that the contents of a message stored using text input will not be transferred over when you select "Message Memory technique" on a particular memory register (the Menu Mode Setting is set to "tyP2").

Decrementing the Contest Number

Use this process if the current contest number gets slightly ahead of the actual number you want to send (in case of a duplicate QSO, for example).

Press the FH-2's [DEC] key momentarily. The current Contest Number will be reduced by one. Press the FH-2's [DEC] key as many times as necessary to reach the desired number. If you go too far, use the "Contest Number Programming" technique desired previously.

FM Mode Operation

Basic Operation

1. Press the [AM/FM] button several times, until the "FM" icon will appear in the display, to select the FM operating mode.
2. Rotate the Main Tuning Dial knob to select the desired operating frequency. Pressing the microphone's [UP] or [DWN] button will cause frequency change in 5 kHz steps.
3. Press the microphone's PTT switch (or press the front panel [MOX] button) to transmit. Speak into the microphone in a normal voice level. Release the PTT or [MOX] switch to return to receive.
4. Adjustment of the microphone gain may be accomplished in two ways. At the factory, a default level has been programmed that should be satisfactory for most

situations. However, using Menu item “056 F3E FM MIC,” you may set a different fixed value, or choose the “ur” option, which then lets you use the front panel [MIC GAIN] knob to set the microphone gain in the FM mode.

Advice:

- ❑ You may change the tuning step of the microphone’s [UP]/[DWN] button via the Menu item “088 TUN FM STEP”.
- ❑ The Transmit Monitor is another helpful way of verifying proper adjustment of the FM MIC Gain. By pressing the [MONI] button, then adjusting the [MONI] knob for a comfortable listening level while you are transmitting, you will be able to hear the difference in deviation as you make adjustments.
- ❑ FM is only used in the 28 MHz and 50 MHz Amateur bands covered in the FT-950. Please do not use FM on any other bands.

Repeater Operation

The FT-950 may be utilized on 29 MHz and 50 MHz repeaters.

1. Rotate the Main Tuning Dial knob to the output frequency (downlink) from the repeater.
2. If CTCSS Tone operation is desired/needed, press and hold in the [AM/FM] button for two seconds to engage the CTCSS mode.
3. Rotate the Main Tuning Dial knob to select the desired CTCSS mode. If you just need to send the uplink encoding tone, select “TN.” For encode/decode operation, choose “TS” instead. The available choices are “OFF” → “TN (Tone Encoder)” → “TS (Tone Squelch)” → “OFF.”
4. Rotate the [CLAR/VFO-B] knob to select the desired CTCSS Tone to be used. A total of 50 standard CTCSS tones are provided (see the CTCSS Tone Chart).
5. Press the [AM/FM] Mode button to select the desired repeater shift direction. The selections are:
“S” → “+” → “-“ → “S”
where “S” represents “Simplex” operation (not used on a repeater).
6. Press and hold in the [AM/FM] button for two seconds to exit from the repeater setup mode.
7. Close the microphone’s PTT switch (or press the [MOX] button) to begin transmission. You will observe that the frequency has shifted to correspond to the programming you set up in the previous steps, and a “T” notation will indicate on the “10 Hz” frequency digit while transmitting. Speak into the microphone in a normal voice level, and release the PTT switch or [MOX] button to return to the

receive mode.

Advice:

- ❑ The Repeater operation will be memorized independently on each VFO stack of the VFO-A and VFO-B.
- ❑ The conventional repeater shift used on 29 MHz is 100 kHz, while on the 50 MHz band the shift may vary between 500 kHz and 1.7 MHz (or more). To program the proper repeater shift, use Menu items “057 F3E 28 RPT” (28 MHz) and “058 F3E 50 RPT” (50 MHz), as appropriate.

Tone Squelch Operation

You may also use “Tone Squelch” whereby your receiver will be kept silent until an incoming signal bearing a matching CTCSS tone is received. Your receiver’s squelch will then open in response to the reception of the required tone.

1. Rotate the Main tuning Dial to the output frequency (downlink) from the repeater.
2. Press and hold in the [AM/FM] button for two seconds to engage the CTCSS mode.
3. Rotate the Main Tuning Dial to choose “TS” from the available choices of “OFF” → “TN (Tone Encoder)” → “TS (Tone Squelch)” → “OFF.”
4. Rotate the [CLAR/VFO-B] knob to select the desired CTCSS Tone to be used. A total of 50 standard CTCSS tones are provided (see the CTCSS Tone Chart).
5. Press and hold in the [AM/FM] button for two seconds. A “D” notation will indicate on the “10 Hz” frequency digit in the display that the Tone Decoder is engaged (a “T” notation will indicate on the “10 Hz” frequency digit while transmitting).

Advice: The Tone Squelch operation will be memorized independently on each VFO stack of the VFO-A and VFO-B.

Memory Operation

Convenient Memory functions

The FT-950 contains ninety-nine regular memories, labeled “01” through “99,” nine special programmed limit memory pairs, labeled “P1L/P1U” through “P9L/P9U,” and five QMB (Quick Memory Bank) memories, labeled “C-1” through “C-5.” Each stores various settings, not only the VFO-A frequency and mode (See below). By default, the 99 regular memories are contained in one group; however, they can be arranged in up to six separate groups, if desired.

Quick Point:

The FT-950's memory channels store the following data (not just the operating frequency):

- VFO-A Frequency
- VFO-A Mode
- Clarifier status and its Offset Frequency
- ANT status
- IPO status
- Roofing filter status and its Bandwidth
- Attenuator status
- Noise Blanker status
- IF SHIFT and WIDTH status
- CONTOUR status and its Peak Frequency
- DSP Noise Reduction (DNR) status and its Reduction algorithm selection.
- DSP Notch filter (NOTCH) status
- NAR bandwidth status
- DSP Auto Notch filter (DNF) status
- Repeater Shift Direction and Shift Frequency
- CTCSS status and Tone Frequency

QMB (Quick Memory Bank)

The Quick Memory Bank consists of five memories (labeled "C-1" through "C-5.") independent from the regular and PMS memories. These can quickly store operating parameters for later recall.

QMB Channel Storage

1. Tune to the desired frequency on the VFO-A.
2. Press the blue [QMB(STO)] button. The "beep" will confirm that the VFO-A contents have been written to the currently-available QMB memory.

If you repeatedly press the [QMB(STO)] button, the QMB memories will be written in the following order: C-2 → C-3 → C-4 → C-5 → C-1.

Once all five QMB memories have data on them, previous data (starting with channel C-1) will be over-written on a first-in, first-out basis.

QMB Channel Recall

1. Press the [QMB(RCL)] button. The current QMB channel's data will be shown on the frequency display field and the QMB memory channel number will be shown in the Multi-Display Window.
2. Repeatedly pressing the [QMB(RCL)] button will toggle you through the QMB channels: C-2 → C-3 → C-4 → C-5 → C-1.

Press the [V/M] button to return to the VFO or Memory mode.

Advice: Rotating the Main Tuning Dial knob, or changing the operating mode, will place the transceiver in the "Memory Tune" mode, which is a temporary "pseudo-VFO" method of tuning off of a stored memory channel. If you do not over-write the contents of the current memory channel, the original contents will not be disturbed by the initiation of Memory Tune operation.

Standard Memory Operation

The Standard Memory of the FT-950 allows storage and recall of up to 99 memories, each storing frequency, mode, and a wide variety of status information detailed previously. Memories may be grouped into as many as six Memory Groups, and additionally you get nine pairs of band-limit (PMS) memories along with five QMB (Quick Memory Bank) memories.

Memory Storage

1. Set the VFO-A up with all frequency, mode, and status the way you want to have it stored.
2. Press the [A>M] button momentarily (the current channel number will start blinking in the Multi-Panel Window); the contents of the current memory channel will be shown on the frequency display field.
3. Rotate the [CLAR/VFO-B] knob to select the memory channel onto which you wish to store the data. If you have selected a channel on which data is already stored, that frequency will appear on the display.
4. Press and hold in the [A>M] button for two seconds to store the frequency and other data into the selected memory channel. A double beep will confirm that you have held the [A>M] button in long enough.

Memory Channel Recall

1. Press the [V/M] button, if necessary, to enter the "Memory mode". A memory

channel number will appear in the Multi-Panel Window.

Advice: If you can not enter the “Memory mode”, check to be sure that the [VFO-B(RX)] Indicator/Switch is illuminated green. If it is, press the [VFO-A(RX)] Indicator/Switch to make the [VFO-B(RX)] Indicator/Switch go out, then press the [V/M] button again.

2. Press the [MCH] button. The orange LED inside the button will light up, indicating that you are ready to recall a memory channel.
3. After pressing the [MCH] button, you may rotate the [CLAR/VFO-B] knob to select the desired memory channel.

Advice: To work within a particular Memory Group, press the [GRP] button (the imbedded LED will glow orange), then rotate the [CLAR/VFO-B] knob to select the desired Memory Group. Now press the [MCH] button (the imbedded LED will glow orange); you may now choose the memory channel within the selected Memory Group.

Checking a Memory Channel's Status

Before programming a channel into memory, you can check the current contents of that channel without the danger of over-writing the channel accidentally.

1. Press the [A>M] button momentarily.
The data stored in the currently-selected memory channel will be displayed in the frequency field. However, since you are only checking the contents of the memory channel, your radio will not have moved to the memory channel's frequency.
2. Rotate the [CLAR/VFO-B] knob to select a different memory channel. To exit from the Memory Check mode, press the [A>M] button momentarily once more.

Advice:

- While the Memory Check function is engaged, the memory channel number will blink in the Multi-Display Window.
- While operating in the VFO mode, using Memory Check, you may store the current VFO frequency into the selected memory by pressing and holding in the [A>M] button for two seconds (until the double beep). Conversely, if you wish to write the contents of the current memory into the VFO-A register, press and hold in the [M>A] button for two seconds.

Erasing Memory Channel Data

1. Press the [V/M] button, if necessary, to enter the VFO mode.

2. Press the [A>M] button. The data stored in the currently-selected memory channel will be displayed in the frequency field.
3. Rotate the [CLAR/VFO-B] knob to select the memory channel that you would like to erase. The memory channel number appears in the Multi-Panel Window.
4. Press the [LOCK] button to erase the contents of the selected memory channel.

Advice:

- The FT-950 can not erase the memory channels “01” (and “US1” through “US5” : U.S. version).
- After erasure, only the memory channel number will remain; the frequency data will disappear from the display.
- If you make a mistake and wish to restore the memory’s contents, just repeat steps (1) through (4) above.

Moving Memory Data to the VFO-A register

You may transfer the contents of the currently-selected memory channel into the VFO-A register, if you like.

1. Press the [V/M] button, as necessary, to go to the “Memory” mode. The memory channel number will appear in the multi-panel window.

Advice: If you can not enter the “Memory” mode, check to be sure that the [VFO-B(RX)] Indicator/Switch is illuminated green. If it is, press the [VFO-A(RX)] Indicator/Switch to make the [VFO-B(RX)] Indicator/Switch go out, then press the [V/M] button again.

2. Press the [MCH] button. The orange LED inside the switch will light up, indicating that you are ready to recall a memory channel.
3. Rotate the [CLAR/VFO-B] knob to select the memory channel the contents of which you wish to transfer to the VFO-A.
4. Press and hold in the [M>A] button for two seconds, until you hear the double beep. The data in the selected memory channel will now be transferred to the VFO-A.

Advice: This transfer of data to the VFO-A does not affect the original contents of the memory channel; this is a “copy” function that leaves the memory contents unchanged.

Memory Tune Operation

You may freely tune off of any memory channel in a “Memory Tune” mode that is similar to VFO operation. So long as you do not over-write the contents of the current

memory, Memory Tune operation will not alter the contents of the memory channel.

1. Press the [V/M] button to recall any memory channel.
Advice: If you can not enter the “Memory mode”, check to be sure that the [VFO-B(RX)] Indicator/Switch is illuminated green. If it is, press the [VFO-A(RX)] Indicator/Switch to make the [VFO-B(RX)] Indicator/Switch go out, then press the [V/M] button again.
2. Rotate the Main Tuning Dial knob; you will now observe that the memory channel’s frequency is changing.
 - The “MT” icon will replace the “MR” icon in the multi-panel window, indicating you are in the “Memory Tune” mode.
 - During Memory Tune operation, you may change operating modes, and engage and offset the Clarifier, if desired.
3. Press the [V/M] button momentarily to return to the originally-memorized frequency of the current memory channel. One more press of the [V/M] button will return you to VFO operation.

Note: Computer software programs utilizing the CAT system interface port may presume that the transceiver is operating in the VFO mode for certain features like “band mapping” and/or frequency logging. Because the “Memory Tune” mode so closely resembles the VFO mode, be sure that you have the FT-950 operating in a control mode compatible with your software’s requirements. Use the VFO mode if you’re not sure.

Memory Groups

Memory channels may be grouped into as many as six convenient batches, for easy identification and selection. For example, you might want to set aside memory groups for AM BC stations, shortwave broadcast stations, contest frequencies, repeater frequencies, and PMS limits, or any other groupings you like.

Each memory group is capable of holding up to 22 memory channels (the Group size is fixed). When a memory channel is grouped, the channel numbers change to correspond to the chart below:

Memory Group Assignment

1. Press the [MENU] button to enter the Menu mode.
2. Rotate the [SELECT] knob to select Menu item “029 GENE MEM GRP”.
Advice: Press the [SELECT] knob to toggle the Menu item display between “029 GENE” and “MEM GRP”.

3. Rotate the [SUB VFO-B] knob to set this Menu item to “On” (the default setting is “OFF”).
4. Press and hold in the [MENU] button for two seconds to save the new setting and exit. Operation will now be restricted to the six Memory Groups.

To cancel Memory Group operation, repeat steps (1) through (4) above, choosing “OFF” in step (3).

Advice: Note that for the PMS memory group, the PMS memories “P1L” through “P9U” will be so designated, so as to avoid confusion.

Memory Channel Number	
Group Memory “OFF”	Group Memory “ON”
01 ~ 19	1-01 ~ 1-19
20 ~ 39	2-01 ~ 2-20
40 ~ 59	3-01 ~ 3-20
60 ~ 79	4-01 ~ 4-20
80 ~ 99	5-01 ~ 5-20
P1L/P1U ~ P9L/P9U	P-1L/P-1U ~ P-9L/P-9U
US1 ~ US5	US-1 ~ US-5

Choosing the Desired Memory Group

You may recall memories just within a particular Memory Group, if desired.

1. Press the [V/M] button, if necessary, to enter the “Memory” mode.
Advice: If you can not enter the “Memory” mode, check to be sure that the [VFO-B(RX)] Indicator/Switch is illuminated green. If it is, press the [VFO-A(RX)] Indicator/Switch to make the [VFO-B(RX)] Indicator/Switch go out, then press the [V/M] button again.
2. Press the [GRP] button (upper and to the right of the [CLAR/VFO-B] knob). The imbedded LED inside the switch will glow orange.
3. Rotate the [CLAR/VFO-B] knob to select the desired Memory Group.
4. Press the [MCH] button (just below the [GRP] button). The imbedded LED inside the switch will glow orange.
5. Rotate the [CLAR/VFO-B] knob to select the desired Memory Channel within the Selected Memory Group.

Advice: If no channels have been assigned to a particular Memory Group, you will not have access to that Group.

Operation on Alaska Emergency Frequency: 5167.5 kHz (U.S. Version Only)

Section 97.401(d) of the regulations governing amateur radio in the United States permit emergency amateur communications on the spot frequency of 5167.5 kHz by stations in (or within 92.6 km of) the state of Alaska. This frequency is only to be used when the immediate safety of human life and/or property are threatened, and is never to be used for routine communications.

The FT-950 includes the capability for transmission and reception on 5167.5 kHz under such emergency conditions via the Menu system. To activate this feature:

1. Press the [MENU] button to enter the Menu mode.
2. Rotate the [SELEC] knob to select “118 TGEN EMRGNCY.”
Advice: Press the [SELECT] knob to toggle the Menu item display between “118 TGEN” and “EMRGNCY”.
3. Rotate the [CLAR/VFO-B] knob to select “EnA (Enable).”
4. Press and hold in the [MENU] button for 2 seconds to save the new setting and exit to normal operation. Emergency communication on this spot frequency is now possible.
5. Press the [V/M] button, as necessary, to enter the Memory mode. Press the [MCH] button, then rotate the [CLAR/VFO-B] knob to select the emergency channel (“EUS”), which is found between channels “US5” and “01”).

Note:

- The receive-mode CLARIFIER functions normally while using this frequency, but variation of the transmit frequency is not possible. Activation of “118 TGEN EMRGNCY” does not enable any other out-of-amateur-band capability on the transceiver. The full specifications of the FT-950 are not necessarily guaranteed on this frequency, but power output and receiver sensitivity should be fully satisfactory for the purpose of emergency communication.
- If you wish to disable operation capability on the Alaska Emergency Frequency, repeat the above procedures, but set “118 TGEN EMRGNCY” to “diS” in step 3.
- In an emergency, note that a half-wave dipole cut for this frequency should be approximately 45’3” on each leg (90’6” total length). Emergency operation on 5167.5 kHz is shared with the Alaska-Fixed Service. This transceiver is not authorized for operation, under the FCC’s Part 87, for aeronautical communications.

VFO and Memory Scanning

You may scan with the VFO or the memories of the FT-950, and the radio will halt the scan on any station with a signal strong enough to open the receiver's squelch.

VFO Scanning

1. Set the VFO-A to the frequency on which you would like to begin scanning.
2. Rotate the [SQL] knob so that the background noise is just silenced.
3. Press and hold in the microphone's [UP] or [DWN] key for two seconds to start scanning in the specified direction on the VFO frequency.

Advice: If you would like to begin scanning on the VFO-B frequency, press the [VFO-B(RX)] Indicator/Switch first, then press and hold in the microphone's [UP] or [DWN] key for two seconds.

4. If the scanner halts on an incoming signal, the decimal point between the "MHz" and "kHz" digits of the frequency display will blink.

Advice:

- If the incoming signal disappears, scanning will resume in about five seconds.
 - On the SSB/CW and SSB-based Data modes, the scanner will pause on a received signal, then will step across the signal very slowly, giving you time to stop the scan, if you like. In these modes on the VFO, the scanner does not stop, however.
5. To cancel the scanning, press the microphone's [UP] or [DWN] key momentarily.

Advice: You may select the manner in which the scanner resumes while it has paused on a signal, using Menu item "034 GENE SCN RSM." The default "5Sec" setting will cause the scanner to resume scanning after five seconds; you may change it, however, to resume only after the carrier has dropped out, if you like See page ???.

Memory Scan

1. Set the transceiver up in the "Memory" mode by pressing the [V/M] button, if necessary.

Advice: If you can not enter the "Memory" mode, check to be sure that the [VFO-B(RX)] Indicator/Switch is illuminated green. If it is, press the [VFO-A(RX)] Indicator/Switch to make the [VFO-B(RX)] Indicator/Switch go out, then press the [V/M] button again.

2. Rotate the [SQL] knob so that the background noise is just silenced.
3. Press and hold in the microphone's [UP] or [DWN] key for two seconds to start

scanning in the specified direction.

Advice:

- If the scanner halts on an incoming signal, the decimal point between the “MHz” and “kHz” digits of the frequency display will blink.
 - If the incoming signal disappears, scanning will resume in about five seconds.
4. To cancel the scanning, press the microphone’s [UP] or [DWN] key momentarily.

Advice:

- During Memory Group operation, only the channels within the current Memory Group will be scanned.
- If the scan has paused on a signal, pressing the microphone’s [UP] or [DWN] key will cause scanning to resume instantly.
- If you press the microphone’s PTT switch during scanning, the scanner will halt at once. Pressing the PTT switch during scanning will not cause transmission, however.
- You may select the manner in which the scanner resumes while it has paused on a signal, using Menu item “034 GEnE SCN RSM.” During memory scanning, the default “5Sec” setting will cause the scanner to resume scanning after five seconds; you may change it, however, to resume only after the carrier has dropped out, if you like. See page ??.

Quick Point: If you have no interest in scanning, and wish to prohibit the microphone’s [UP]/[DOWN] keys from initiating scanning, you may disable scanning control from the microphone using Menu item “033 GENE MIC SCN” (set it to “OFF”).

PMS

To limit scanning (and manual tuning) within a particular frequency range, you can use the Programmable Memory Scanning (PMS) feature, which utilizes nine special-purpose memory pairs (“P1L/P1U” through “P9L/P9U”). The PMS feature is especially useful in helping you to observe any operating sub-band limits which apply to your Amateur license class.

1. Store the Lower and Upper tuning/scanning limit frequencies into the memory pair “P1L” and “P1U,” respectively, or any other “L/U” pair of memories in the special PMS memory area. See page ?? for details regarding memory storage.

2. Press the [V/M] button to enter the “Memory” mode.
Advice: If you can not enter the “Memory” mode, check to be sure that the [VFO-B(RX)] Indicator/Switch is illuminated green. If it is, press the [VFO-A(RX)] Indicator/Switch to make the [VFO-B(RX)] Indicator/Switch go out, then press the [V/M] button again.
3. Press the [MCH] button momentarily. The imbedded LED inside the switch will glow orange.
4. Rotate the [CLAR/VFO-B] knob to select memory channel “P1L or “P1U.”
5. Rotate the [SQL] knob so that the background noise is just silenced.
6. Turn the Main Tuning Dial knob slightly (to activate memory tuning). Tuning and scanning are now limited to the range within the P1L/P1U limits until you press the [V/M] button to return to memory channel or VFO operation.
7. Press and hold in the microphone’s [UP] or [DWN] key for two seconds to start scanning in the specified direction.

Advice:

- If the scanner halts on an incoming signal, the decimal point between the “MHz” and “kHz” digits of the frequency display will blink.
 - If the incoming signal disappears, scanning will resume in about five seconds.
 - On the SSB/CW and SSB-based Data modes, the scanner will pause on a received signal, then will step across the signal very slowly, giving you time to stop the scan, if you like. In these modes on the VFO, the scanner does not stop, however.
 - If the scan has paused on a signal, pressing the microphone’s [UP] or [DWN] key will cause scanning to resume instantly.
8. If you rotate the Main Tuning Dial knob in the opposite direction from the current scanning direction (in other words, you rotate the dial to the left when scanning toward a higher frequency), the direction of the scan will reverse.
 9. If you press the microphone’s PTT switch during scanning, the scanner will halt at once. Pressing the PTT switch *during scanning* will not cause transmission, however.

Packet Operation

Packet operation is easily accomplished on the FT-950 by connecting your TNC (Terminal Node Controller) to the transceiver, per the illustration. “Packet” operation also applies to SSB-based AFSK data modes, such as PSK31, etc.

Packet Setup (Including Subcarrier Frequency)

Before operation can commence, some basic setup procedures must be performed, using the Menu, to configure your radio for the data mode to be used.

Menu Item	Available Values
050 DATA DT GAIN	0 ~ 100
051 DATA OUT LVL	0 ~ 100
052 DATA VOX DLY	30 ~ 3000 ms
053 DATA V GAIN	0 ~ 100
054 DATA PKTDISP	-3000 ~ 3000 Hz
056 DATA PKT SFT	-3000 ~ 3000 Hz

Basic Setup

1. Press the [RTTY/PKT] button repeatedly to select desired Packet mode. By pressing the [RTTY/PKT] button to mode changes:

PKT-LSB → PKT-USB → PKT-FM → RTTY-LSB → RTTY-USB → PKT-LSB ...

Advice:

- For HF operation, SSB-based Data operation is generally used. Press the [RTTY/PKT] button repeatedly until the “PKT” and “LSB” icons will appear on the display.
 - If you need to do FM-based 1200-baud packet on the 29/50 MHz bands, press the [RTTY/PKT] button repeatedly until the “PKT” and “FM” icons will appear on the display, to engage the “PKT-FM” mode.
 - When both the “PKT” and “USB” icons are appeared on the display, the FT-950 has engaged Packet operation in the “USB” mode.
2. When the “transmit” command is received from the TNC, the transmitter of the FT-950 will automatically be engaged. Likewise, the command to return to receive will cause the radio to revert to the receive mode.

Advice:

- If you need to adjust the output level from the “DATA OUT” pin (pin 5) of the RTTY/PKT jack on the rear panel of the transceiver, please use Menu item “051 DATA OUT LVL”. For the input level from the TNC, as applied to the DATA IN pin (pin 1) of the RTTY/PKT jack, please use Menu item “050 DATA DT GAIN”.
- During Packet operation via the rear panel’s RTTY/PKT jack, the front panel MIC jack is cut off, so you won’t have a “live microphone” problem during data operation.

Note: If you anticipate making data transmissions of longer than a few minutes, we recommend that reduce the transmitter power to 1/3 ~ 1/2 of its normal maximum via the Menu item “111 TGEN TX PWR”.

Quick Point: PACKET Jack Specifications

DATA IN (pin 1)	Nominal Input Level: 50 mVp-p	Impedance: 10 k-Ohms
DATA OUT (Pin 5)	Maximum Output Level: 100 mVp-p	Impedance: 10 k-Ohms

RTTY (Radio Teletype) Operation

Most RTTY operation today is accomplished using a TNC or other computer-based system that utilizes AFSK tones. As such, the previous discussion on LSB-mode “Packet” operation will apply for Baudot operation, as well. For RTTY operation using a Terminal Unit (TU) or the “FSK” output from a TNC, please see the discussion below. See also the illustration for details regarding connection to your TU.

Setting Up for RTTY Operation

Before commencing RTTY operation, please direct your attention to the setup steps shown in the chart to the right.

Menu Item	Available Values
059 RTTY R PLRTY	Nor (normal) / rEU (reverse)
060 RTTY T PLRTY	Nor (normal) / rEU (reverse)
061 RTTY OUT LEL	0 ~ 100
062 RTTY SHIFT	170/200/425/850 Hz
063 RTTY TONE	1275/2125 Hz

Basic Setup

1. Press the [RTTY/PKT] button repeatedly until both the “RTTY” and “LSB” icons will appear on the display; engage RTTY operation using “LSB” injection, which is generally used in the Amateur service.
2. To switch to USB-side injection in RTTY, press the [RTTY/PKT] button once more. Both the “RTTY” and “USB” icons will appear on the display.
3. When you begin typing on your TU or computer keyboard, the command to transmit should automatically be sent to the transceiver, causing it to enter the transmit mode.

Note: If you anticipate making data transmissions of longer than a few minutes, we

recommend that reduce the transmitter power to 1/3 ~ 1/2 of its normal maximum via the Menu item “111 TGEN TX PWR”.

Advice:

- ❑ If you need to adjust the output level from the “DATA OUT” pin (pin 5) of the RTTY/PKT jack on the rear panel of the transceiver, please use Menu item “061 RTTY OUT LVL”. For the input level from the TU, there is no adjustment of the FSK input level (Pin 4) of the RTTY/PKT jack; please make any needed level adjustments at the TU side.
- ❑ The Mark/Space Shift utilized in most Amateur RTTY operation is 170 Hz. Other shifts may be configured, however, using Menu item “062 RTTY SHIFT”. The FT-950 is set up for “high tone” operation (centered on 2125 Hz) by default, but you may configure it for low tone (1275 Hz) operation using Menu item “063 RTTY TONE”.
- ❑ You may find that you are unable to decode some RTTY stations, even if they are of sufficient signal strength. If this is observed, there may be a Mark/Space polarity problem between your station and the other station. If so, try setting Menu item “059 RTTY R PLRITY” to “rEU” (“Reverse”) to see if that permits copy. A separate Menu Item permits reversal of your transmitter’s Mark/Space polarity: “060 RTTY T PLRITY”.

Quick Point: In the FT-950, “RTTY” is a mode defined as being an “FSK” mode, whereby the closing and opening of a keying line (to ground) causes the Mark/Space tones to alternate. The RTTY mode is not an AFSK based mode in this transceiver, and the AFSK output tones from a TNC will not cause Mark/Space shifting to occur. Use the “Packet” mode for AFSK-based Baudot and other data modes.

Miscellaneous AFSK-Based Data Modes

The FT-950 may also be used for a host of other SSB-based Data modes. Please set up your system using the illustration as a guideline.

Quick Point: When you have configured Menu item “114 TGEN VOX SEL” to “dAtA,” the transceiver will operate in a “VOX” mode, and it is not necessary to connect a PTT line. This makes for very convenient interfacing to computer Sound Cards, etc.

Menu Mode

The Menu system of the FT-950 provides extensive customization capability, so you can set up your transceiver just the way you want to operate it. The Menu items are grouped by general utilization category, and are numbered from “001 AGC FST DLY” to “118 TGEN EMRGNCY”.

Using the Menu

1. Press the [MENU] button momentarily, to engage the Menu mode.
The display will show the Menu Number, Menu Group Name, and Menu Item. Press the [SELECT] knob to toggle the display between “Menu Number & Menu Group Name” and “Menu Item”. The Multi-Display Window shows the current setting of the currently-selected Menu item.
2. Rotate the [SELECT] knob to select the Menu item you wish to work on.
3. Rotate the [CLAR/VFO-B] knob to change the current setting of the selected Menu item.
4. When you have finished making your adjustments, press and hold in the [MENU] button for two seconds to save the new setting and exit to normal operation. If you only *momentarily* press the [MENU] button, the new settings will not be retained.

Menu Mode Reset

You may reset all the Menu settings to their original factory defaults, if desired.

1. Turn the front panel [POWER] switch off.
2. Press and hold in the [MENU] button, and while holding it in, press the [POWER] switch to turn the transceiver back on. Now release the [MENU] button.

AGC Group

001 AGC FST DLY

Function: Sets the delay time for the AGC FAST mode.

Available Values: 20 ~ 4000 msec (20 msec/step)

Default Setting: 300 msec

002 AGC MID DLY

Function: Sets the delay time for the AGC MID mode.

Available Values: 20 ~ 4000 msec (20 msec/step)

Default Setting: 700 msec

003 AGC SLW DLY

Function: Sets the delay time for the AGC SLOW mode.

Available Values: 20 ~ 4000 msec (20 msec/step)

Default Setting: 3000 msec

DISPLAY Group

004 DISP COLOR

Function: Selects the Display color when the optional Data Management Unit (DMU-2000) is connected.

Available Values: bL1/bL2/bL3/ub1/ub2

bL1: COOL BLUE

bL2: CONTRAST BLUE

bL3: FLASH WHITE

ub1: CONTRAST UMBER

ub2: UMBER

Default Setting: bL1 (COOL BLUE)

Advice: If the optional DMU-2000 Data Management Unit is not connected, this adjustment has no effect.

005 DISP DIM VFD

Function: Setting of the display brightness level.

Available Values: 0 ~ 7

Default Setting: 4

006 DISP BAR SEL

Function: Selects one of three parameters to be viewed on the Tuning Offset Indicator.

Available Values: CLAr/C-tn/u-tn

Default Setting: C-tn

CLAr: Displays relative clarifier offset.

C-tu: Displays relative tuning offset between the incoming signal and transmitted frequency while CW operation.

u-tn: Displays the peak position of the optional μ -TUNE filter.

007 DISP PKH S

Function: Selects the peak hold time of the S-meter.

Available Values: OFF/0.5/1.0/2.0 sec

Default Setting: OFF

008 DISP PKH PO

Function: Selects the peak hold time of the PO meter.

Available Values: OFF/0.5/1.0/2.0 sec

Default Setting: OFF

009 DISP PKH ALC

Function: Selects the peak hold time of the ALC meter.

Available Values: OFF/0.5/1.0/2.0 sec

Default Setting: OFF

010 DISP PKH ID

Function: Selects the peak hold time of the ID meter.

Available Values: OFF/0.5/1.0/2.0 sec

Default Setting: OFF

011 DISP RTR STU

Function: Selects the starting point of your rotator controller's indicator needle.

Available Values: 0/90/180/270°

Default Setting: 0°

Advice: If the optional DMU-2000 Data Management Unit is not connected, this adjustment has no effect.

012 DISP RTR ADJ

Function: Adjusts the indicator needle precisely to the starting point set in menu item "011 DISP RTR STU."

Available Values: -30 ~ 0

Default Setting: 0

Advice: If the optional DMU-2000 Data Management Unit is not connected, this adjustment has no effect.

013 DISP QMB MKR

Function: Enables/Disables the QMB Marker (White arrow "▽") to display on the Spectrum Band Scope when the optional DMU-2000 Data Management Unit is

connected.

Available Values: On/OFF

Default Setting: On

Advice: If the optional DMU-2000 Data Management Unit is not connected, this adjustment has no effect.

DVS Group

014 DUS RX LVL

Function: Sets the audio output level from the optional Voice Memory Unit.

Available Values: 0 ~ 100

Default: 50

Advice: If the optional ??? Voice Memory Unit is not connected, this adjustment has no effect.

015 DUS TX LVL

Function: Sets the microphone input level to the optional Voice Memory Unit

Available Values: 0 ~ 100

Default: 50

Advice: If the optional ??? Voice Memory Unit is not connected, this adjustment has no effect.

KEYER SETUP Group

016 KEY BEACON

Function: Sets the interval time between repeats of the beacon message.

Available Values: OFF/1 ~ 255 sec

Default Setting: OFF

017 KEY NUM STL

Function: Selects the Contest Number "Cut" format for an imbedded contest number.

Available Values: 1290/AunO/Aunt/A2nO/A2nt/12nO/12nt

Default Setting: 1290

1290: Does not abbreviate the Contest Number

AunO: Abbreviates to "A" for "One," "U" for "Two," "N" for "Nine," and "O" for "Zero."

Aunt: Abbreviates to "A" for "One," "U" for "Two," "N" for "Nine," and "T" for "Zero."

A2nO: Abbreviates to “A” for “One,” “N” for “Nine,” and “O” for “Zero.”

A2nt: Abbreviates to “A” for “One,” “N” for “Nine,” and “T” for “Zero.”

12nO: Abbreviates to “N” for “Nine,” and “O” for “Zero.”

12nt: Abbreviates to “N” for “Nine,” and “T” for “Zero.”

018 KEY CONTEST

Function: Enters the initial contest number that will increment/decrement after sending during contest QSOs.

Available Values: 1 ~ 9999

Default Setting: 1

Advice: Press the [CLEAR] button to reset the contest number to “1”.

019 KEY CW MEM1

Function: Permits entry of the CW message for message register 1.

Available Values: tyP1/tyP2

Default Setting: tyP2

tyP1: You may enter the CW message from the Main Tuning Dial knob and [CLAR/VFO-B] knob.

tyP2: You may enter the CW message from the CW keyer.

020 KEY CW MEM2

Function: Permits entry of the CW message for message register 2.

Available Values: tyP1/tyP2

Default Setting: tyP2

tyP1: You may enter the CW message from the Main Tuning Dial knob and [CLAR/VFO-B] knob.

tyP2: You may enter the CW message from the CW keyer.

021 KEY CW MEM3

Function: Permits entry of the CW message for message register 3.

Available Values: tyP1/tyP2

Default Setting: tyP2

tyP1: You may enter the CW message from the Main Tuning Dial knob and [CLAR/VFO-B] knob.

tyP2: You may enter the CW message from the CW keyer.

022 KEY CW MEM4

Function: Permits entry of the CW message for message register 4.

Available Values: tyP1/tyP2

Default Setting: tyP2

tyP1: You may enter the CW message from the Main Tuning Dial knob and [CLAR/VFO-B] knob.

tyP2: You may enter the CW message from the CW keyer.

023 KEY CW MEM5

Function: Permits entry of the CW message for message register 5.

Available Values: tyP1/tyP2

Default Setting: tyP2

tyP1: You may enter the CW message from the Main Tuning Dial knob and [CLAR/VFO-B] knob.

tyP2: You may enter the CW message from the CW keyer.

GENERAL Group

024 GENE ANT SEL

Function: Sets the method of antenna selection.

Available Values: bAnd/rEG

Default Setting: bAnd

bAnd: The antenna is selected in accordance with the operating band.

rEG: The antenna is selected in accordance with the band stack (different antennas may be utilized on the same band, if so selected in the band stack).

025 GENE BEP LVL

Function: Sets the beep level.

Available Values: 0 ~ 100

Default Setting: 50

026 GENE CAT BPS

Function: Sets the transceiver's computer-interface circuitry for the CAT baud rate to be used.

Available Values: 4800/9600/384H (38400) bps

Default Setting: 4800 bps

027 GENE CAT TOT

Function: Sets the Time-Out Timer countdown time for a CAT command input.

Available Values: 10/100/1000/3000 msec

Default Setting: 10 msec

The Time-Out Timer shuts off the CAT data input after the continuous transmission of the programmed time.

028 GENE CAT RTS

Function: Enables/Disables the RTS port of the CAT jack.

Available Values: On/OFF

Default Setting: OFF

029 GENE MEM GRP

Function: Enables/Disables Memory Group Operation.

Available Values: On/OFF

Default Setting: OFF

030 GENE Q SPLIT

Function: Selects the tuning offset for the Quick Split feature.

Available Values: -20 ~ 0 ~ +20 kHz (1 kHz Step)

Default Setting: +5 kHz

031 GENE TX TOT

Function: Sets the Time-Out Timer countdown time.

Available Values: OFF/5/10/15/20/25/30 min

Default Setting: OFF

The Time-Out Timer shuts off the transmitter after continuous transmission of the programmed time.

032 GENE μ T DIAL

Function: Selects the μ -TUNE mode.

Available Values: StP1/ StP2/OFF

Default Setting: StP1

StP-1: Activates the μ -TUNE system using “COARSE” steps of the [SELECT(μ -TUNE)] knob (2 steps/click) on the 7 MHz and lower amateur

bands. On the 10/14 MHz bands, “FINE” [SELECT(μ -TUNE)] knob steps will be used (1 step/click).

StP2: Activates the μ -TUNE system using “FINE” steps of the [SELECT(μ -TUNE)] knob (1 step/click) on the 14 MHz and lower amateur bands.

Advice: If an optional RF μ Tuning Kit is not connected, this adjustment has no effect.

033 GENE MIC SCN

Function: Enables/disables scanning access via the microphone’s [UP]/[DWN] keys.

Available Values: On/OFF

Default Setting: On

034 GENE SCN RSM

Function: Selects the Scan Resume mode.

Available Values: CAR/5SEc

Default Setting: 5SEc

CAR: The scanner will hold until the signal disappears, then will resume after one second.

5SEc: The scanner will hold for five seconds, then resume whether or not the other station is still transmitting.

035 GENE FRQ ADJ

Function: Adjusts the reference oscillator.

Available Values: -25 ~ 0 ~ +25

Default Setting: 0

Connect a 50-Ohm dummy load and frequency counter to the antenna jack; adjust the [CLAR/VFO-B] knob so that the frequency counter reading is same as the VFO frequency while pressing the PTT switch.

Advice: Do not perform this Menu item unless you have a high-performance frequency counter. Perform this Menu item after aging the transceiver and frequency counter sufficiently (at least 30 minutes).

MODE-AM Group

036 A3E MICGAIN

Function: Sets the microphone gain for the AM mode.

Available Values: Ur/0 ~ 100

Default Setting: Ur

When this menu is set to “Ur”, you may adjust the microphone gain using the front panel’s [MIC GAIN] knob.

MODE-CW Group

037 A1A F-TYPE

Function: Selects the desired keyer operation mode for the device connected to the front panel’s KEY jack.

Available Values: OFF/buG/ELE/ACS

Default Setting: ELE

OFF: Disables the front panel’s keyer (“straight key” mode for use with external keyer or computer-driven keying interface).

buG: Mechanical “bug” keyer emulation. One paddle produces “dits” automatically, while the other paddle manually produces “dahs”.

ELE: Iambic keyer with ACS (Automatic Character Spacing) disabled.

ACS: Iambic keyer with ACS (Automatic Character Spacing) enabled.

038 A1A F-REV

Function: Selects the keyer paddle’s wiring configuration for the KEY jack on the front panel.

Available Values: nor/rEV

Default Setting: nor

nor: Tip = Dot, Ring = Dash, Shaft = Ground

rEV: Tip = Dash, Ring = Dot, Shaft = Ground

039 A1A R-TYPE

Function: Selects the desired keyer operation mode for the device connected to the rear panel’s KEY jack.

Available Values: OFF/buG/ELE/ACS

Default Setting: ELE

OFF: Disables the front panel’s keyer (“straight key” mode for use with external keyer or computer-driven keying interface).

buG: Mechanical “bug” keyer emulation. One paddle produces “dits” automatically, while the other paddle manually produces “dahs”.

ELE: Iambic keyer with ACS (Automatic Character Spacing) disabled.

ACS: Iambic keyer with ACS (Automatic Character Spacing) enabled.

040 A1A R-REV

Function: Selects the keyer paddle's wiring configuration for the KEY jack on the rear panel.

Available Values: nor/rEV

Default Setting: nor

nor: Tip = Dot, Ring = Dash, Shaft = Ground

rEV: Tip = Dash, Ring = Dot, Shaft = Ground

041 A1A CW AUTO

Function: Enables/disables CW keying while operating on SSB.

Available Values: OFF/50/On

Default Setting: OFF

OFF: Disables CW keying while operating on SSB.

50: Enables CW keying only while operating SSB on 50 MHz (but not HF).

On: Enables CW keying while operating on SSB (all TX bands).

Note: This feature allows you to move someone from SSB to CW without having to change modes on the front panel.

042 A1A BFO

Function: Sets the CW carrier oscillator injection side for the CW mode.

Available Values: USb/LSb/Auto

Default Setting: USb

USb: Injects the CW carrier oscillator on the USB side.

LSb: Injects the CW carrier oscillator on the LSB side.

Auto: Injects the CW carrier oscillator on the LSB side while operating on the 7 MHz band and below, and the USB side while operating on the 10 MHz band and up.

043 A1A BK-IN

Function: Sets the CW "break-in" mode.

Available Values: SEni/FuLL

Default Setting: SEni

SEni (SEMI): The transceiver will operate in the semi break-in mode. The delay (receiver recovery) time is set via the Menu item "044 A1A DELAY".

FuLL: The transceiver will operate in the full break-in (QSK) mode.

044 A1A DELAY

Function: Adjusts the Keying Delay (receiver recovery) time on the CW mode.

Available Values: 30 ~ 3000 msec

Default Setting: 300 msec

045 A1A PITCH

Function: Adjusts your preferred CW tone pitch.

Available Values: 300 ~ 1050 Hz

Default Setting: 700 Hz

046 A1A WEIGHT

Function: Sets the Dot:Dash ratio for the built-in electronic keyer.

Available Values: (1:) 2.5 ~ 4.5

Default Setting: 3.0

047 A1A FRQDISP

Function: Selects the frequency Display Format for the CW mode.

Available Values: dir/OFS

Default Setting: OFS

dir (Direct Frequency): Displays the receiver carrier frequency, without any offset added. When changing modes between SSB and CW, the frequency display remains constant.

OFS (Pitch Offset): This frequency display reflects the added BFO offset.

048 A1A PC KYNG

Function: Enables/disables CW keying from the "DATA IN" terminal on the rear panel's RTTY/PKT jack while operating on the CW mode.

Available Values: EnA (Enable)/diS (Disable)

Default Setting: diS (Disable)

049 A1A QSKTIME

Function: Selects the time delay between when the PTT is keyed and the carrier is transmitted during QSK operation when using the internal keyer.

Available Values: 15/20/25/30 msec

Default Setting: 15 msec

MODE-DAT Group

050 DATA DT GAIN

Function: Sets the data input level from the TNC to the AFSK modulator.

Available Values: 0 ~ 100

Default Setting: 50

051 DATA OUT LVL

Function: Sets the AFSK data output level at the output port (pin ?) of the RTTY/PKT jack.

Available Values: 0 ~ 100

Default Setting: 50

052 DATA VOX DLY

Function: Adjusts the “VOX” Delay (receiver recovery) time on the PACKET mode.

Available Values: 30 ~ 3000 msec

Default Setting: 300 msec

053 DATA V GAIN

Function: Adjusts the “VOX” Gain on the PACKET mode.

Available Values: 0 ~ 100

Default Setting: 50

054 DATA PKTDISP

Function: Sets the packet frequency display offset.

Available: -3000 ~ +3000 Hz (10 Hz/step)

Default: 0 Hz

056 DATA PKT SFT

Function: Sets the carrier point during the SSB packet operation.

Available: -3000 ~ +3000 Hz (10 Hz/step)

Default: 1000 Hz (typical center frequency for PSK31, etc.)

MODE-FM Group

056 F3E MIC

Function: Sets the microphone gain for the FM mode.

Available Values: Ur/0 ~ 100

Default Setting: 50

When this menu is set to “Ur,” you may adjust the microphone gain using the front panel’s [MIC GAIN] knob.

057 F3E 28 RPT

Function: Sets the magnitude of the repeater shift on the 28 MHz band.

Available Values: 0 ~ 1000 kHz

Default Setting: 100 kHz

058 F3E 50 RPT

Function: Sets the magnitude of the repeater shift on the 50 MHz band.

Available Values: 0 ~ 4000 kHz

Default Setting: 1000 kHz

MODE-RTTY Group

059 RTTY R PLRTY

Function: Selects normal or reverse Mark/Space polarity for RTTY receive operation.

Available Values: nor/rEV

Default Setting: nor

060 RTTY T PLRTY

Function: Selects normal or reverse Mark/Space polarity for RTTY transmit operation.

Available Values: nor/rEV

Default Setting: nor

061 RTTY OUT LVL

Function: Sets the RTTY (AFSK) data output level at the output port (pin ?) of the RTTY/PKT jack.

Available Values: 0 ~ 100

Default Setting: 50

062 RTTY SHIFT

Function: Selects the frequency shift for RTTY (AFSK) operation.

Available Values: 170/200/425/850 Hz

Default Setting: 170 Hz

063 RTTY TONE

Function: Selects the Mark tone for RTTY operation.

Available Values: 1275/2125 Hz

Default Setting: 2125 Hz

MODE-SSB Group

064 A3J TX BPF

Function: Selects the audio passband of the DSP modulator on the SSB mode.

Available Values: 1-30/1-29/2-28/3-27/4-26

1-30: 100 ~ 3000 (Hz)

1-29: 100 ~ 2900 (Hz)

2-28: 200 ~ 2800 (Hz)

3-27: 300 ~ 2700 (Hz)

4-26: 400 ~ 2600 (Hz)

Default Setting: 3-27: 300 ~ 2700 (Hz)

Note: the *apparent* power output, when using the widest bandwidths, may seem lower. This is normal, and it occurs because the available transmitter power is distributed over a wider bandwidth. The greatest compression of power output, conversely, occurs when using the “4-26” setting (400 ~ 2600 Hz), and this setting is highly recommended for contest or DX pile-up work.

065 A3J LSB CAR

Function: Adjusts the receiver carrier point for the LSB mode.

Available Values: -200 Hz ~ +200 Hz (10 Hz steps)

Default Setting: 0 Hz

066 A3J USB CAR

Function: Adjusts the receiver carrier point for the USB mode.

Available Values: -200 Hz ~ +200 Hz (10 Hz steps)

Default Setting: 0 Hz

RX GENE Group

067 RGEN NB LVL

Function: Adjusts the noise blanking level of the IF Noise Blanker.

Available Values: 0 ~ 100

Default Setting: 50

068 RGEN CNTR LV

Function: Adjusts the parametric equalizer gain of the Contour filter.

Available Values: -40 ~ +20 dB

Default Setting: -15 dB

069 RGEN CNTR WI

Function: Adjusts the Q-factor of the Contour filter.

Available Values: 1 ~ 11

Default Setting: 10

070 RGEN DNF

Function: Enables/disables the Digital Notch Filter.

Available Values: OFF/On

Default Setting: OFF

071 RGEN DNR

Function: Set the Digital Noise Reduction response.

Available Values: OFF/1 ~ 16

Default Setting: OFF

072 RGEN NOTCH W

Function: Selects the bandwidth of the DSP NOTCH filter

Available Values: nArr (Narrow)/uuid (Wide)

Default Setting: uuid (Wide)

SCOPE Group

Advice: This group's adjustment has no effect if the optional DMU-2000 Data

Management Unit is not connected.

073 SCP 1.8 FIX

Function: Selects the scan start frequency of the FIX mode Spectrum Scope while monitoring on the 160 m amateur band.

Available Values: 1.700 ~ 1.999 MHz (1 kHz steps)

Default Setting: 1.800 MHz

074 SCP 3.5 FIX

Function: Selects the scan start frequency of the FIX mode Spectrum Scope while monitoring on the 80 m amateur band.

Available Values: 3.400 ~ 3.999 MHz (1 kHz steps)

Default Setting: 3.500 MHz

075 SCP 5.2 FIX

Function: Selects the scan start frequency of the FIX mode Spectrum Scope while monitoring on the 60 m amateur band.

Available Values: 5.100 ~ 5.499 MHz (1 kHz steps)

Default Setting: 5.250 MHz

076 SCP 7.0 FIX

Function: Selects the scan start frequency of the FIX mode Spectrum Scope while monitoring on the 40 m amateur band.

Available Values: 6.900 ~ 7.299 MHz (1 kHz steps)

Default Setting: 7.000 MHz

077 SCP 10.1 FIX

Function: Selects the scan start frequency of the FIX mode Spectrum Scope while monitoring on the 30 m amateur band.

Available Values: (1)0.000 ~ (1)0.149 MHz (1 kHz steps)

Default Setting: (1)0.100 MHz

078 SCP 14.0 FIX

Function: Selects the scan start frequency of the FIX mode Spectrum Scope while monitoring on the 20 m amateur band.

Available Values: (1)3.900 ~ (1)4.349 MHz (1 kHz steps)

Default Setting: (1)4.000 MHz

079 SCP 18.0 FIX

Function: Selects the scan start frequency of the FIX mode Spectrum Scope while monitoring on the 17 m amateur band.

Available Values: (1)8.000 ~ (1)8.199 MHz (1 kHz steps)

Default Setting: (1)8.068 MHz

080 SCP 21.0 FIX

Function: Selects the scan start frequency of the FIX mode Spectrum Scope while monitoring on the 15 m amateur band.

Available Values: (2)0.900 ~ (2)1.449 MHz (1 kHz steps)

Default Setting: (2)1.000 MHz

081 SCP 24.8 FIX

Function: Selects the scan start frequency of the FIX mode Spectrum Scope while monitoring on the 12 m amateur band.

Available Values: (2)4.800 - (2)4.989 MHz (1 kHz steps)

Default Setting: (2)4.890 MHz

082 SCP 28.0 FIX

Function: Selects the scan start frequency of the FIX mode Spectrum Scope while monitoring on the 10 m amateur band.

Available Values: (2)7.900 ~ (2)9.699 MHz (1 kHz steps)

Default Setting: (2)8.000 MHz

083 SCP 50.0 FIX

Function: Selects the scan start frequency of the FIX mode Spectrum Scope while monitoring on the 6 m amateur band.

Available Values: (4)9.900 ~ (5)3.999 MHz (1 kHz steps)

Default Setting: (5)0.000 MHz

TUNING Group

084 TUN DIALSTP

Function: Setting of the Main Tuning Dial knob's tuning speed on the SSB, CW, and

AM modes.

Available Values: 1 or 10 Hz

Default Setting: 10 Hz

085 TUN CW FINE

Function: Enabling/disabling of the “Fine” tuning speed in the CW mode.

Available Values: EnA/diS (ENABLE/DISABLE)

Default Setting: diS (DISABLE)

EnA (ENABLE): Tuning in 1 Hz steps on the CW mode.

diS (DISABLE): Tuning according to the steps determined via menu item “084 TUN DIALSTP.”

086 TUN MHz SEL

Function: Selects the tuning steps for the [CLAR/VFO-B] knob when the [MHz] button is pressed.

Available Values: 1 or 0.1 MHz

Default Setting: 1 MHz

087 TUN AM STEP

Function: Selects the tuning steps for the microphone’s [UP]/[DWN] keys in the AM mode.

Available Values: 2.5/5/9/10/12.5 kHz

Default Setting: 5 kHz

088 TUN FM STEP

Function: Selects the tuning steps for the microphone’s [UP]/[DWN] keys in the FM mode.

Available Values: 5/6.25/10/12.5/25 kHz

Default Setting: 5 kHz

089 TUN FM DIAL

Function: Setting of the Main Tuning Dial knob’s tuning speed in the FM mode.

Available Values: 10 or 100 Hz

Default Setting: 100 Hz

090 TUN MY BAND

Function: Programs a band to be skipped while selecting bands using the [CLAR/VFO-B] knob.

To program the band to be skipped, rotate the [CLAR/VFO-B] knob to recall the band to be skipped while selecting bands via the [CLAR/VFO-B] knob, then press the [ENT] button to change this setting to “ON” (a “d” notation will replace the “E” notation). Repeat the same procedure to cancel the setting (skipped “Off”: “d” notation appears).

TX AUDIO Group

091 TAUD EQ1 FRQ

Function: Selects the center frequency of the lower range for the parametric microphone equalizer.

Available Values: OFF/100 ~ 700 Hz (100 Hz/step)

Default Setting: OFF

OFF: The equalizer gain and Q-factor are set to factory defaults (flat).

100 ~ 700: Center frequencies of 100 Hz ~ 700 Hz.

You may adjust the equalizer gain and Q-factor at this selected audio frequency via menu items “092 TAUD EQ1 LVL” and “093 TAUD EQ1 BW.”

092 TAUD EQ1 LVL

Function: Adjusts the equalizer gain of the low range of the parametric microphone equalizer.

Available Values: -10 ~ +10

Default Setting: +5

093 TAUD EQ1 BW

Function: Adjusts the Q-factor of the low range of the parametric microphone equalizer.

Available Values: 1 ~ 10

Default Setting: 10

094 TAUD EQ2 FRQ

Function: Selects the center frequency of the middle range for the parametric microphone equalizer.

Available Values: OFF/700 ~ 1500 Hz (100 Hz/step)

Default Setting: OFF

OFF: The equalizer gain and Q-factor are set to factory defaults (flat).

700 ~ 1500: Center frequencies of 700 Hz ~ 1500 Hz.

You may adjust the equalizer gain and Q-factor at this selected audio frequency via menu items “095 TAUD EQ2 LVL” and “096 EQ2 BW.”

095 TAUD EQ2 LVL

Function: Adjusts the equalizer gain of the middle range of the parametric microphone equalizer.

Available Values: -10 ~ +10

Default Setting: +5

096 TAUD EQ2 BW

Function: Adjusts the Q-factor of the middle range of the parametric microphone equalizer.

Available Values: 1 ~ 10

Default Setting: 10

097 TAUD EQ3 FRQ

Function: Selects the center frequency of the high range for the parametric microphone equalizer.

Available Values: OFF/1500 ~ 2000 Hz (100 Hz/step)/3200 Hz

Default Setting: OFF

OFF: The equalizer gain and Q-factor are set to factory defaults (flat).

15 ~ 20/32: Center frequencies of 1500 Hz ~ 3200 Hz.

You may adjust the equalizer gain and Q-factor in this selected audio frequency via menu items “098 TAUD EQ3 LVL” and “100 TAUD EQ3 BW.”

098 TAUD EQ3 LVL

Function: Adjusts the equalizer gain of the high range of the parametric microphone equalizer.

Available Values: -10 ~ +10

Default Setting: +5

099 TAUD EQ3 BW

Function: Adjusts the Q-factor of the high range of the parametric microphone equalizer.

Available Values: 1 ~ 10

Default Setting: 10

100 TAUD PE1 FRQ

Function: Selects the center frequency of the lower range for the parametric microphone equalizer when the speech processor is activated.

Available Values: OFF/100 ~ 700 Hz (100 Hz/step)

Default Setting: OFF

OFF: The equalizer gain and Q-factor are set to factory defaults (flat).

100 ~ 700: Center frequencies of 100 Hz ~ 700 Hz.

You may adjust the equalizer gain and Q-factor at this selected audio frequency via menu items “102 TAUD PE1 LVL” and “102 TAUD PE1 BW.”

101 TAUD PE1 LVL

Function: Adjusts the equalizer gain of the low range of the parametric microphone equalizer when the speech processor is activated.

Available Values: -10 ~ +10

Default Setting: +5

102 TAUD PE1 BW

Function: Adjusts the Q-factor of the low range of the parametric microphone equalizer when the speech processor is activated.

Available Values: 1 ~ 10

Default Setting: 10

103 TAUD PE2 FRQ

Function: Selects the center frequency of the middle range for the parametric microphone equalizer when the speech processor is activated.

Available Values: OFF/700 ~ 1500 Hz (100 Hz/step)

Default Setting: OFF

OFF: The equalizer gain and Q-factor are set to factory defaults (flat).

700 ~ 1500: Center frequencies of 700 Hz ~ 1500 Hz.

You may adjust the equalizer gain and Q-factor at this selected audio frequency via menu items “104 TAUD PE2 LVL” and “105 TAUD PE2 BW.”

104 TAUD PE2 LVL

Function: Adjusts the equalizer gain of the middle range of the parametric microphone equalizer when the speech processor is activated.

Available Values: -10 ~ +10

Default Setting: +5

105 TAUD PE2 BW

Function: Adjusts the Q-factor of the middle range of the parametric microphone equalizer when the speech processor is activated.

Available Values: 1 ~ 10

Default Setting: 10

106 TAUD PE3 FRQ

Function: Selects the center frequency of the high range for the parametric microphone equalizer when the speech processor is activated.

Available Values: OFF/1500 ~ 2000 Hz (100 Hz/step)/3200 Hz

Default Setting: OFF

OFF: The equalizer gain and Q-factor are set to factory defaults (flat).

15 ~ 20/32: Center frequencies of 1500 Hz ~ 3200 Hz.

You may adjust the equalizer gain and Q-factor in this selected audio frequency via menu items “107 TAUD PE3 LVL” and “108 TAUD PE3 BW.”

107 TAUD PE3 LVL

Function: Adjusts the equalizer gain of the high range of the parametric microphone equalizer when the speech processor is activated.

Available Values: -10 ~ +10

Default Setting: +5

108 TAUD PE3 BW

Function: Adjusts the Q-factor of the high range of the parametric microphone equalizer when the speech processor is activated.

Available Values: 1 ~ 10

Default Setting: 10

TX GNRL Group

109 TGEN PROCLVL

Function: Sets a compression level of the Speech Processor.

Available Values: 0 ~ 100

Default Setting: 50

110 TGEN EXT TUN

Function: Enable/disable the optional FC-40 Antenna Tuner.

Available Values: EnA/diS (ENABLE/DISABLE)

Default Setting: diS (DISABLE)

EnA (ENABLE): The [TUNE] button will activate the optional FC-40 Antenna Tuner.

diS (DISABLE): The [TUNE] button will activate the internal Antenna Tuner.

111 TGEN TX PWR

Function: Sets a transmitter output level.

Available Values: 5 ~ 100 %

Default Setting: 100 %

112 TGEN AM CAR

Function: Sets a carrier power output level.

Available Values: 0 ~ 100

Default Setting: 50

113 TGEN PWRCTRL

Function: Affecting the menu item “111 TGEN TX PWR”.

Available Values: ALL/CAR

Default Setting: ALL

ALL: The Menu Item “111 TGEN TX PWR” affects all modes.

CAR: The Menu Item “111 TGEN TX PWR” affects all modes except SSB. In this case, the SSB output power will be set to maximum, regardless of the setting of the Menu Item “111 TGEN TX PWR”.

114 TGEN VOX SEL

Function: Selects the audio input source for triggering TX during VOX operation.

Available Values: nic/dAtA

Default Setting: nic

nic(MIC): The VOX function will be activated by microphone audio input.

dAtA(DATA): The VOX function will be activated by data audio input.

115 TGEN V GAIN

Function: Adjusts the “VOX” Gain on the SSB/AM/FM modes.

Available Values: 0 ~ 100

Default Setting: 50

116 TGEN VOX DLY

Function: Adjusts the “VOX” Delay (receiver recovery) time on the SSB/AM/FM modes.

Available Values: 30 ~ 3000 msec

Default Setting: 300 msec

117 TGEN ANTIVOX

Function: Adjusts the Anti-VOX Trip Gain which is the level of negative feedback of receiver audio to the microphone, to prevent receiver audio from activating the transmitter (via the microphone) during VOX operation.

Available Values: 0 ~ 100

Default Setting: 50

118 TGEN EMRGNCY

Function: Enables Tx/Rx operation on the Alaska Emergency Channel, 5167.5 kHz.

Available Values: EnA(ENABLE)/diS(DISABLE)

Default Setting: diS(DISABLE)

When this Menu Item is set to “EnA(ENABLE),” the spot frequency of 5167.5 kHz will be enabled. The Alaska Emergency Channel will be found between the Memory channels “P-1” and “01 (or 1-01).”

Important: The use of this frequency is restricted to stations operating in or near Alaska, and only for emergency purposes (never for routine operations). See §97.401(c) of the FCC’s regulations for details.

Installation of Optional Accessories

RF μ Tuning Kit

The RF μ Tuning Kit provides ultra-sharp RF selectivity for the front end of the transceiver. Very high Q is made possible by the narrow-band design. Three RF μ Tuning Kit are available. The MTU-160 covers the 1.8 MHz band. The MTU-80/40 covers the 3.5 and 7 MHz bands. The MTU-30/20 covers 10.1 and 14 MHz bands.

The narrow bandwidth is especially useful on the low bands, when many strong signals are being received via NVIS propagation (Near Vertical-Incidence Signals) within a narrow bandwidth. The added protection for the RF stage is especially helpful in

preventing IMD and blocking.

Installation

Assemble the RF μ Tuning Unit according to the “RF μ Tuning Kit Installation Manual” supplied from the RF μ Tuning Kit.

Interconnections to FT-950

Connect each cable (supplied from the RF μ Tuning Kit) between the RF μ Tuning Unit and the FT-950 Transceiver.

Advice:

- The RF connecting cables are color coded (black and gray) to assist in properly connecting the RF IN and RF OUT jacks. (see illustration)
- Miss-connection will not damage the RF μ Tuning Kit. However, improper operation may occur.
- Connect the color-coded control cable(s) between the CNTL OUT and CNTL IN jacks (see illustration). Confirm all connections before turning on the transceiver.
- If the FT-950 does not operate and the frequency display blinks sometimes, confirm and correct the “CNTL IN” and “CNTL OUT” connections on the RF μ Tuning Unit.
- The order of connecting multiple RF μ Tuning Unit is not important.

Operation

Please see page ?? on this Operating Manual.

Specifications

General

Rx Frequency Range:	30 kHz – 56 MHz (operating) 160 - 6 m (specified performance, Amateur bands only)
Tx Frequency Ranges:	160 - 6 m (Amateur bands only)
Frequency Stability:	±0.5 ppm (after 1 minute @77 °F [25 °C]) ±1.0 ppm (after 1 minute @14 °F ~ +122 °F [-10 °C ~ +50 °C])
Operating Temperature Range:	14 °F ~ +122 °F (-10 °C ~ +50 °C)
Emission Modes:	A1A (CW), A3E (AM), J3E (LSB, USB), F3E (FM), F1B (RTTY), F1D (PACKET), F2D (PACKET)
Frequency Steps:	1/10 Hz (SSB, CW, & AM), 100 Hz (FM)
Antenna Impedance:	50 Ω, unbalanced 16.7 - 150 Ω, unbalanced (Tuner ON, 160 - 10 m Amateur bands, TX only) 25 - 100 Ω, unbalanced (Tuner ON, 6 m Amateur band, TX only)
Power Consumption (Approx.):	Rx (no signal) 2.0 A Rx (signal present) 2.5 A Tx (100 W) 22 A
Supply Voltage:	DC 13.8 V ± 10% (Negative Ground)
Dimensions (WxHxD):	14.4" x 4.5" x 12.4" (365 x 115 x 314.5 mm)
Weight (Approx.):	28.7 lbs (13 kg)

Transmitter

Power Output:	5 - 100 watts (2 - 25 watts AM carrier)
Modulation Types:	J3E (SSB): Balanced, A3E (AM): Low-Level (Early Stage), F3E (FM): Variable Reactance
Maximum FM Deviation:	±5.0 kHz/±2.5 kHz
Harmonic Radiation:	Better than -60 dB (160 - 10m Amateur bands: Harmonics) Better than -50 dB (160 - 10m Amateur bands: Others) Better than -65 dB (6m Amateur band)

SSB Carrier Suppression: At least 60 dB below peak output
 Undesired Sideband Suppression: At least 60 dB below peak output
 3rd-order IMD: -31 dB @14 MHz 100 watts PEP
 Bandwidth: 3 kHz (LSB/USB), 500 Hz (CW),
 6 kHz (AM), 16 kHz (FM)
 Audio Response (SSB): Not more than -6 dB from 300 to 2700 Hz
 Microphone Impedance: 600 Ω (200 to 10 k Ω)

Receiver

Circuit Type: Triple-conversion Superheterodyne
 Intermediate Frequencies: 69.450 MHz/450 kHz/30 kHz (24 kHz for AM/FM)
 Sensitivity (RF AMP 2 "ON"):

SSB (BW: 2.4 kHz, 10 dB S+N/N)
 2 μ V (0.5 - 1.8 MHz)
 0.2 μ V (1.8 - 30 MHz)
 0.125 μ V (50 - 54 MHz)

AM (BW: 6 kHz, 10 dB S+N/N, 30 % modulation @400 Hz)
 6 μ V (0.5 - 1.8 MHz)
 2 μ V (1.8 - 30 MHz)
 1 μ V (50 - 54 MHz)

FM (BW: 15 kHz, 12 dB SINAD)
 0.5 μ V (28 - 30 MHz)
 0.35 μ V (50 - 54 MHz)

There is no specification in a frequency ranges not listed.

Squelch Sensitivity: SSB/CW/AM
 (RF AMP 2 "ON") 2 μ V (0.1 - 1.8 MHz)
 2 μ V (50 - 54 MHz)

FM
 1 μ V (28 - 30 MHz)
 1 μ V (50 - 54 MHz)

There is no specification in a frequency ranges not listed.

Selectivity (WIDTH: Center):

Mode	-6 dB	-60 dB
CW/RTTY/PKT	0.5 kHz or better	750 Hz or less
SSB	2.4 kHz or better	3.6 kHz or less
AM	6 kHz or better	15 kHz or less
FM	15 kHz or better	25 kHz or less

Image Rejection: 70 dB or better (160 - 10m Amateur bands)

	60 dB or better (6m Amateur band)
Maximum Audio Output:	2.5 W into 4 Ω with 10% THD
Audio Output Impedance:	4 to 8 Ω (4 Ω : nominal)
Conducted Radiation:	Less than 4 nW

Specifications are subject to change, in the interest of technical improvement, without notice or obligation, and are guaranteed only within the amateur bands.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Part 15.21: Changes or modifications to this device not expressly approved by Vertex Standard could void the user's authorization to operate this device.

DECLARATION BY MANUFACTURER

The scanner receiver is not a digital scanner and is incapable of being converted or modified to a digital scanner receiver by any user.